A TEXT-BOOK OF DOMESTIC SCIENCE

MATILDA G. CAMPBELL

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A TEXTBOOK OF DOMESTIC SCIENCE

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A TEXTBOOK OF DOMESTIC SCIENCE

FOR HIGH SCHOOLS

BY

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PREFACE

This textbook has been compiled in response to an ever increasing demand from instructors of Domestic Science for a book which can be placed in the hands of the student to use as a laboratory manual in the school, and as a practical cook-book in the home.

To this end facts already being taught in well-established schools of Domestic Science have here been arranged in a concise manner, but much has been omitted that the instructor will necessarily supply according to the needs of her school and locality. Sanitation, chemistry of cleaning, shelter, and many other subjects included under the term Domestic Science have not been considered here, as a proper treatment of them would produce sufficient material for another textbook.

The contents of this book are confined largely to the subjects of food and nutrition and the application of heat to foods. Although the study of the natural sciences should be correlated with a course in Domestic Science, the text has not presupposed much knowledge of chemistry, physics, etc., on the part of the student.

In view of the varying conditions that prevail in domestic science courses it has not been thought best to introduce any discussion of methods of instruction, but the arrangement and presentation of lessons has been left to the discretion of the instructor.

It is earnestly hoped that the text will prove of genuine assistance to classes which are now overburdened with note-taking in gathering the fundamental principles of the science of food and nutrition.

The author wishes to acknowledge a debt of gratitude to various standard authorities, freely quoted in the text.

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TEXTBOOK OF DOMESTIC SCIENCE

CHAPTER I

THE RELATION OF FOOD TO THE BODY

Foods are substances which, when taken into the body, provide it with heat and other forms of energy, and furnish it with material for growth and repair. In the case of a grown person, foods supply the fuel necessary for various bodily activities — for walking, for mounting stairs, for lifting weights; and they keep the bodily machinery in repair. In the case of a growing person, they also supply materials for building up the bodily machinery.

In order to understand how food can serve the body in the ways mentioned, it is necessary to know something about the composition of the body and also about the composition of food. Both, however, are exceedingly complex, and even those who are devoting their lives to the study of foods in their relation to the body have still much to discover upon the subject. The science of nutrition is a growing science, about which we hope in time to know much more than we do at present.

As we study the substances found in nature we find that they are composed of elements which combine to form many compounds. An element may be defined as a substance which has never been divided into anything simpler than itself. A compound is a substance which is composed of two or more elements. In all nature chemists have as

yet discovered only about eighty elements and of these all compounds are made up.

In the body there are known to be fifteen elements, which are combined to form over one hundred compounds.

ELEMENTS PRESENT IN THE HUMAN BODY (H. C. SHERMAN)

1. Oxygen	6. Phosphorus	11. Magnesium
2. Carbon	7. Potassium	12. Iron
3. Hydrogen	8. Sulphur	13. Iodine
4. Nitrogen	9. Sodium	14. Fluorine
5. Calcium	10. Chlorine	15. Silicon

The body is constantly undergoing changes by which complex compounds are broken down, and new, simpler compounds are formed and are given off through the lungs and skin, from the kidneys, and otherwise. The result of this is that new material, containing the same elements as the compounds constantly excreted, must be supplied to the body in the form of food. A well-known chemist has referred to the material which the body can use for repair and building of tissues as its " building stones." These " building stones " must not only contain the elements of which the body is composed, but they must also be in a form in which the body can utilize them.

In order to prepare the " building stones " to repair the body and to furnish it with fuel, many of them must first be changed by heat in the process of cooking, and they are all acted upon by the digestive juices after being taken into the body.

All changes of matter are of two kinds, physical and chemical. A physical change is one that does not cause a change in the composition of a substance, as the dissolving of sugar

in water, for the water being evaporated, the sugar will retain its physical properties.

NOTE. — Student make a list of physical changes.

A chemical change is one that causes a change in the composition of a substance, as, for example, the burning of sugar, when it loses all its physical properties.

NOTE. — Student make a list of chemical changes.

The science of chemistry has to do with chemical changes. The science of physics has to do with physical changes.

In the preparation of food, and in its digestion, assimilation, and excretion from the body, a series of very complex chemical and physical changes occurs.

Among the most important and most abundant of the elements found in the body are oxygen, carbon, hydrogen, nitrogen, phosphorus, and sulphur.

Oxygen is a colorless, odorless, tasteless gas and is the great supporter of life and combustion. It forms one-fifth of the volume of air and eight-ninths of the weight of water. It is a very active element, uniting with all other elements but one. It is more abundantly distributed in nature than any other element and forms about 66 per cent of the human body.

NOTE. — Teacher prepare oxygen and perform some simple experiments to illustrate its properties, using any standard Chemistry as a guide.

Carbon is an odorless and tasteless solid. It is found in nature in a nearly pure state in several different forms. The diamond, hard coal, and graphite, while having vastly different physical properties, are almost pure carbon. All living organisms, both animal and vegetable, contain carbon, and over one hundred thousand carbon compounds have

been artificially prepared in the laboratory. Under certain circumstances carbon unites chemically with oxygen, forming carbon monoxide (CO) or carbon dioxide (CO_2). Heat is given off during this change. Carbon and its compounds form the larger part of fuels and of fuel- or heat-giving foods.

Hydrogen is a colorless, odorless, tasteless gas and is the lightest substance known. It burns easily, or unites chemically with oxygen, forming water (H_2O), heat being given off during this change. Hydrogen burns in the body, but the heat is not intense. Hydrogen, as well as carbon, is found in fuels and in fuel foods; in general, the higher the percentage of hydrogen in a food, the greater the amount of heat it yields when it burns.

NOTE. — Teacher prepare hydrogen and perform some simple experiments to illustrate its properties, using a standard Chemistry as a guide.

Nitrogen is a colorless, odorless, tasteless gas. It forms about four-fifths of the atmosphere. It is an inert gas and forms compounds which easily decompose, a process which, as we shall see later, is due to the action of tiny living organisms called bacteria. Nitrogen is present in the protoplasm, the jellylike content of cells of plants and animals, and is an essential constituent of all living organisms. The human body contains about 2.4 per cent of nitrogen, which is obtained from certain foods that furnish nitrogen in a form that the body can digest and assimilate. Prominent among these foods are meat, eggs, fish, milk, etc.; without a certain amount of such foods the body would undergo nitrogen starvation.

Sulphur is a yellow, combustible solid. It is always present in cell protoplasm in combination with the nitrogen compounds, and is essential for the body. Plants absorb

sulphur compounds, or sulphates from the soil, and animals obtain the sulphates which they require from vegetable foods and from meat, milk, eggs, etc. When foods that contain sulphur decompose under the action of bacteria, the sulphur unites with some of the hydrogen present, forming hydrogen sulphide (H_2S), the disagreeable odor of which is known in spoiled eggs.

Phosphorus is a highly combustible solid and in the pure state it is exceedingly poisonous. In combination in the form of phosphates, it is essential to every living cell in the body and must be supplied to the body by such foods as contain the phosphates in a form in which the body can assimilate them. Among these foods are meat, milk, egg yolk, wheat, grains, and the legumes.

Organic and Inorganic Matter. — All matter may be classified as organic or inorganic. All organic substances contain carbon. All substances that are formed during the processes of life are organic and, as before stated, great numbers of carbon compounds have been artificially prepared.

NOTE. — Student make a list of eight organic substances.
NOTE. — Student make a list of eight inorganic substances.

Chemical Symbols. — In writing the names of elements it is often inconvenient to write the full name, hence the elements are designated by their initial letters, or by those of their Latin names. These abbreviations are called symbols and represent one atom of the element and its combining weight.

SYMBOLS OF THE ELEMENTS FOUND IN THE HUMAN BODY

1. Oxygen	O	5. Calcium	Ca
2. Carbon	C	6. Phosphorus	P
3. Hydrogen	H	7. Potassium	K
4. Nitrogen	N	8. Sulphur	S

9. Sodium	Na	13. Iodine	I
10. Chlorine . . .	Cl	14. Fluorine	F
11. Magnesium . .	Mg	15. Silicon	Si
12. Iron	Fe		

Chemical Formulas and Equations. — The combination of symbols which represents the elements found in a molecule of a compound is called a chemical formula. H_2O is the formula for a molecule of water, water being composed of two parts by volume of hydrogen and one part of oxygen. CO_2 is the formula for carbon dioxide, which is composed of one part by volume of carbon and two parts of oxygen.

When a substance undergoes a chemical change, or when two or more elements or compounds unite chemically, these changes may be represented by means of symbols or formulas in the form of an equation:

$$H_2 + O = H_2O$$
$$C + O_2 = CO_2$$
$$C + O = CO \text{ (Carbon Monoxide)}$$

CHAPTER II

AIR AND COMBUSTION

Air. — Air is necessary for the support of life and combustion. It is a mixture, not a compound; that is, the substances of which it is composed are not chemically combined.

It has definite weight. At the sea level the atmosphere exerts a pressure of fifteen pounds on every square inch of surface, but as the pressure is equal in every direction, we are not crushed by this weight.

Air is composed of about one-fifth oxygen and four-fifths nitrogen. There are present also varying amounts of carbon dioxide (CO_2), watery vapor, ammonia, dust, bacteria, etc. The nitrogen is not in a form in which it can be utilized by either plants or animals. Upon the roots of certain plants, as clover, peas, beans, etc., are found nodules containing bacteria which have the power of taking nitrogen from the air and changing it to such compounds of nitrogen as can be utilized by the plant. From these compounds the plant builds complex nitrogenous compounds which it stores in its cells as protein.

The oxygen in the air supports combustion.

Experiment 1. — Light a splint and insert it in a dry, empty test tube. Is the flame extinguished? Why?

Experiment 2. — Put a lamp chimney over a lighted candle. Admit air from the bottom. Does the candle burn freely?

Hold a strip of tissue paper near the bottom of the chimney, and also above the chimney. Explain the cause of movement of the paper. Cover the chimney on top and also exclude air from the bottom. Does the candle continue to burn? Give reason.

EXPERIMENT 3. — (To be performed by the instructor.) Float a cork with a small piece of phosphorus on it in a pan of water. Ignite the phosphorus and cover it quickly with a bell jar. (A fruit jar may be used.)

With what does the phosphorus unite in burning to form the dense white fume?

What becomes of this fume as it disappears?

What part of the jar is filled with water?

What component of the air has been burned out? What component of the air remains in the jar, preventing the water from filling the entire jar?

What proportion of the air is oxygen? nitrogen?

EXPERIMENT 4. — To examine air for dust, bacteria, etc.

Put a drop of glycerine on a clean glass microscope slide. Expose to the dust of the room until the next lesson. Cover the glycerine with a cover glass and examine under a microscope, first with a low power and then with a high power. Make a drawing of what you see.

Oxidation and Combustion. — Oxidation, or combustion, is the union of oxygen with any other substance. The process may be slow or rapid, but in either case heat is given off, even though not rapidly enough to be perceptible. Example: the rusting of iron is really the burning of iron, but the process is so slow that we do not detect the heat given off.

Fuels are composed largely of carbon and hydrogen which, in burning, unite with oxygen of the air giving off heat.

Products of Combustion.

EXPERIMENT 5. — Hold a saucer in a candle flame. Note the black deposit that forms on it. What element is present in the candle? What is smoke? Do we get the maximum heat from fuel when smoke is given off during combustion?

Identification Test for Carbon Dioxide. — Put some filtered lime-water in a glass beaker or tumbler. Breathe through a glass tube

into the limewater, which will become cloudy from the carbon dioxide present in the breath exhaled from the lungs. This test is used to identify carbon dioxide, which always causes limewater to become cloudy. An excess of CO_2 causes the cloudiness to disappear.

Experiment 6. — Hold a bell jar over a burning candle for a short time, collecting any gases which may be given off during combustion. Invert the bell jar, pour into it some filtered limewater, cover the jar, and shake well. Does the limewater become cloudy? What gas was given off during the burning of the candle?

Experiment 7. — Cover a burning candle with a dry bell jar. Note the formation of water on the sides of the jar. Is the water a product of combustion? Write the equation for the forming of H_2O.

Summary of products of combustion:

$C + O = CO$, carbon monoxide, a poisonous gas given off in combustion when the supply of oxygen is deficient. The blue flame on the surface of a coal fire is burning CO. All stoves should have perfect chimney connections to carry off this poisonous gas.

$C + O_2 = CO_2$, carbon dioxide.

$H_2 + O = H_2O$, water.

Unconsumed carbon = smoke.

Mineral matter = ash.

Flame. — When two substances unite chemically, and both are gases or vapors at the temperature of combustion, the act of union is accompanied by a flame. When one of the substances remains solid at the temperature of combustion, heat and light are given off, but there is no flame. Many substances which are solids or liquids at ordinary temperatures vaporize slowly when at the temperature of burning and hence burn with a flame. The light given by the flame is caused by the glowing, or incandescence, of the solid carbon particles. At a higher temperature the carbon

is quickly and completely burned and gives no light, but burns with a blue flame.

When gas is used as a fuel it is mixed with air before burning, in order that it may be diluted, when there will be a more perfect combustion. A gas used as fuel should burn with a blue flame; a yellow or a smoky flame indicates that the carbon is not being completely consumed and there is an attendant loss of heat.

NOTE. — Students examine carefully a Bunsen or other gas burner, increasing and decreasing the supply of oxygen by opening and closing the mixer. Note the varying color of the flame and the seeming increase or loss of heat.

Kindling Point. — Every combustible solid must be raised to a certain temperature, or kindling point, before it will unite rapidly enough with oxygen to produce light. This temperature varies with different substances, but is always the same for the same substance. The kindling point of phosphorus is very low. Ordinary parlor matches are tipped with phosphorus, potassium chlorate, and glue. The heat produced by the friction of striking the match is sufficient to raise the phosphorus to its burning point. The heat produced by the burning of the phosphorus raises the wood of the match to its kindling point, and the match ignites.

NOTE. — Student explain the steps in fire building by which hard coal may be raised to its kindling point.

Flash Point. — The temperature to which a fat or oil must be raised before an inflammable vapor is given off is called the flash point. This is a valuable indication of the safety of an oil.

Fuels. — A fuel is a combustible substance usually composed of carbon and hydrogen.

NOTE. — Student prepare a list of fuels —

SOLIDS	LIQUIDS	GASES
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

NOTE. — Students inspect specimens of hard and soft woods; charcoal; peat; bituminous, anthracite, and cannel coal; various fuel oils; alcohols.

Students write paper on the "Story of Coal."

Students procure the current market price of the various fuels listed above. From the cost of a basket of coal or "bundle of wood," estimate the price paid for a ton of coal and a cord of wood when purchased in small quantities.

Heat. — Heat is molecular motion.

Sources of heat:

1. Mechanical energy.
   Produced by friction or by collision.
2. Chemical energy.
   Produced by combustion or by chemical union of different compounds or elements.
3. Electrical energy.
   As produced by an electric toaster, etc., or by the sun's rays.

Heat is transferred from one body to another or to different parts of the same body by conduction, convection, and radiation.

Conduction:

EXPERIMENT 8. — Place rods of wood, metal, and glass on an asbestos mat over a gas burner with the ends of the rods extending beyond the mat. The metal rod will soon become hot, while the other two will not be appreciably heated. Metals are good con-

ductors of heat and cold, glass and wood are poor conductors. Air is a very poor conductor.

The conduction of heat consists of the transfer of motion from molecule to molecule.

NOTE. — Students make a list of good conductors; of poor conductors.

Why are wooden handles placed upon teakettles, flat-irons, etc.? Why is the handle of a kettle sometimes made in the form of a spiral? Why is the outer portion of an ice cream freezer made of wood? Why is the inner can made of metal? What is the principle upon which a fireless cooker is constructed? a thermos bottle? How should the oven of a stove be constructed?

Convection:

EXPERIMENT 9. — Partly fill a glass beaker with water, add one half teaspoon of sawdust, and heat slowly. A movement will be seen in the sawdust, indicating that the heat sets up currents in the water which have an upward direction immediately over the flame. The water nearest the flame becomes heated and expands; this makes it lighter and it rises, while the cold water of the top takes its place, thus causing the currents noted. This method of heat transference, which takes place in liquids and in gases, is called convection. There are convection currents in the atmosphere, caused by the unequal heating of the earth by the sun. The air over a heated portion of the earth rises, and the cool air rushes in to take its place.

NOTE. — What is the principle of heating a building with a hot-water system? How should a room be ventilated?

Radiation:

EXPERIMENT 10. — When you hold your hand in front of a fire, heat travels directly from the fire to the hand. This method of heat transference, in which heat travels in straight lines, or radiates through the atmosphere, is known as radiation.

NOTE. — How is heat transferred in making toast? in broiling? Is there loss of heat from radiation in the ordinary cook stove?

NOTE.—Students examine the stoves and ranges in use in the domestic science laboratory. Make drawings of them, showing the principle of heat conveyance and the system of dampers used for admitting oxygen to the fire and for controlling the heat currents. Bring a detailed drawing of the stove used at home. Test various parts of the school oven with paper or flour, showing in what part of the oven the heat is the most intense. Examine also and make drawings of

1. Gas burners and their mixers.
2. Fireless cookers.
3. Electric stoves.
4. Kerosene stoves.
5. Gasoline stoves.

Discuss the evolution of the cook stove. Catalogues showing modern stoves, including gas stoves, electric stoves, etc., should be shown to students or be collected by them.

The construction of cook stoves is at present in a transition stage and drawings are not given in this text, as it is hoped soon that the construction of stoves will be materially changed. The loss of heat and the attendant waste of fuel in heating an ordinary oven is very great. It is said that only about seven per cent of the heat is utilized. Modern stoves are now being constructed with non-conducting substances around the air chambers which surround the ovens so that the waste of heat is much reduced. An oven thermometer should be placed on every oven to substitute a scientific means of regulation for the old-fashioned dependence on "luck" when baking. With gas and electric stoves a thermostat should shut off heat when a certain temperature has been attained, the baking being then completed by the retained heat of the oven.

Cooking is the art of preparing food for the nourishment of the human body by the aid of heat. We cook food to make it more palatable, more digestible, and to destroy any harmful bacteria which it may contain.

The processes of cooking may be classed as:

1. Boiling.
   a. Cooking directly in water.
   b. Steaming.
      (1) Moist, cooking in a steamer.
      (2) Dry, cooking in double boiler.
2. Roasting.
   a. Roasting in front of open fire.
   b. Roasting in hot oven.
3. Broiling.
   a. Broiling over red-hot coals or gas flame.
   b. Pan-broiling in very hot pan (without fat).
4. Frying.
   a. Deep frying.
   b. Sautéing, or frying in small amount of fat.

Boiling:

Experiment 11. — Put cold water in glass beaker or stewpan. Heat. With thermometer note temperature at which small bubbles form on the bottom and sides of the beaker and rise to the surface. What are these bubbles? Where do they break? Note temperature at which larger bubbles rise; and also note temperature when the surface of the water is completely agitated. What are these large bubbles? Where do they break? What is the temperature of simmering water? of boiling water? How is the heat of the fire conveyed to the water? How is the heat conveyed through the water? Note the deposit left on the pan after the water has boiled away; what is this deposit? Give two reasons why boiled water tastes flat. Why should water be freshly boiled for tea and coffee? How can you improve the taste of water which has been boiled?

Experiment 12. — Let water boil gently. Note temperature. Let it boil rapidly. Note temperature. Does water get hotter than its boiling point in an ordinary kettle? What becomes of the

excess heat? What important point in the economy of fuel in cooking does this emphasize?

EXPERIMENT 13. — *A*. Put equal amounts of water in two beakers of the same size. Let the water in one beaker boil gently for about five minutes; in the other let it boil rapidly. Compare the rate of evaporation of the water in the two beakers.

B. Put equal amounts of water in two vessels of equal capacity, having one vessel shallow and broad and the other deep and narrow. Boil the water in them for an equal length of time and compare the rate of evaporation in the two vessels. Does the shape of the pan used and the rapidity of boiling have any bearing on practical cookery?

EXPERIMENT 14. — Mix $\frac{1}{2}$ cup of sugar and $\frac{1}{2}$ cup of water; boil and note temperature, with confectioner's or laboratory thermometer; compare boiling point of the mixture with that of boiling water. Continue the boiling, noting any change of temperature.

Stages in Sugar Boiling:

Soft Ball. — At 237° F. drop some of the sugar mixture into ice water. Form it into a ball between the thumb and finger, keeping under the water.

Hard Ball. — At 256° F. drop some of the mixture into ice water. Form it into a ball and compare with the soft ball.

Soft Crack. — At 290° F. drop some of mixture into ice water. This cracks, but if put between the teeth, will stick.

Hard Crack. — At 310° F. drop some of mixture into ice water. This cracks, but does not stick to the teeth.

Continue boiling the syrup until it is a light brown color, or caramel. Pour into a tin pan and let cool.

Under what condition does the boiling point of a liquid vary? Explain the value of a thermometer in candy making.

Boiling Point. — The boiling point of water at sea level is 212° Fahrenheit or 100° centigrade. The boiling points of liquids vary both with their composition and with the atmospheric pressure. It is necessary for water to overcome the atmospheric pressure before it can be changed to steam. If the altitude increases, as in ascending a mountain, the atmospheric pressure is lessened, hence less heat is required to overcome it, and water boils at a lower temperature. The boiling point of water is decreased 1° F. for each increase of 479 feet in altitude. What is the temperature of boiling water on Mt. Blanc?

TABLE OF ABBREVIATIONS

Ts. — Teaspoonful	**Qt.** — Quart
Tb. — Tablespoonful	**Lb.** — Pound
C. — Cupful	**Oz.** — Ounce
Ssp. — Saltspoonful	**M.** — Minute
Pt. — Pint	**H.** — Hour

Measurements. — All measurements in this book are level. Accurate measuring is necessary to insure uniform success in cookery and to eliminate the element of "luck."

The standard measuring cup is one holding one-half pint.

The standard tablespoon is one holding one-sixteenth of a cupful.

One-half spoonful is measured by dividing the spoonful in two lengthwise.

Flour is measured after being sifted once, and is placed in the cup with a spoon that it may not be packed. The flour should be rounded slightly in the cup and then be leveled off with a knife.

EQUIVALENT WEIGHTS AND MEASURES

To be verified by class or by individual experiment.

4 ssp. = 1 ts.	8 or 9 eggs = 1 lb.
2 ts. = 1 tb.	4 c. flour = 1 lb.
16 tb. = 1 c.	2 c. butter = 1 lb.
2 gills = 1 c.	2 c. gran. sugar = 1 lb.
2 c. = 1 pt.	$2\frac{1}{2}$ c. pow. sugar = 1 lb.
2 pt. = 1 qt.	$2\frac{3}{4}$ c. corn meal = 1 lb.
4 qt. = 1 gal.	2 c. raisins = 1 lb.
8 qt. = 1 peck	2 c. chopped meat = 1 lb.
4 pk. = 1 bu.	1 tb. butter = $\frac{1}{2}$ oz.
	1 tb. sugar = $\frac{1}{2}$ oz.

CHAPTER III

CLASSIFICATION OF FOODS — CARBOHYDRATES

Classification of Foods and their General Uses in the Body:

A. Organic Foods.

1. *Carbohydrates.*

Composed of carbon, hydrogen, and oxygen.

Examples. — 1. Starch in cereals, etc.
2. Sugar.
3. Cellulose.

Uses in body. — 1. To supply heat and energy.
2. To form fat.

2. *Fats.*

Composed of carbon, hydrogen, and oxygen.

Examples. — 1. Fat of meats.
2. Cream.
3. Butter.
4. Olive oil, etc.

Uses in body. — 1. To supply heat and energy.
2. To form fat.

3. *Protein.*

Composed of carbon, hydrogen, oxygen, nitrogen, sulphur, and sometimes phosphorus.

Examples. — 1. Albumen of egg.
2. Casein of milk.
3. Fibrin of meat.
4. Gluten of wheat.
5. Legumen of peas and beans, etc.

Uses in body. — 1. To form tissue.
2. To supply heat and energy.
3. To form fat.

B. Inorganic Foods.

1. *Water.*

Composed of hydrogen and oxygen, H_2O.

Uses in body. — 1. Forms two-thirds of body weight.
2. Carrier of nutritive material and of waste products.

2. *Mineral Matter.*

Examples. — 1. Sodium chloride.
2. Phosphate of lime.
3. Compounds of potassium, iron, magnesium, etc.

Uses in body. — 1. Aid in forming bone, teeth, etc.
2. Assist in digestion.
3. Necessary for tissues, blood, etc.

C. Food Adjuncts and Accessories.

1. *Condiments and Spices.*

Examples. — 1. Mustard.
2. Pepper.
3. Spices.

Uses in body. — 1. Stimulate the appetite.
2. Increase flow of digestive fluids.

2. *Vegetable Acids.*

Examples. — 1. Citric acid in lemons and oranges.
2. Malic acid in apples.
3. Oxalic acid in rhubarb.
4. Tartaric acid in grapes.

3. *Caffeine* in tea and coffee.
Theobromine in cocoa.

CARBOHYDRATES

A carbohydrate is a compound composed of carbon, hydrogen, and oxygen. Hydrogen and oxygen are always present in the same proportion as they are in water — 2 : 1 (H_2O).

Chemical Formula:

Cellulose	$(C_6H_{10}O_5)_n$.
Starch	$(C_6H_{10}O_5)_n$.
Glucose	$(C_6H_{12}O_6)$.
Cane Sugar	$(C_{12}H_{22}O_{11})$.

The carbohydrates include starches, sugars, and plant fibers, or cellulose.

Carbohydrates are found

1. In plants as starches, sugars, and cellulose.
2. In milk as lactose or milk sugar.
3. In the liver of animals as glycogen or animal starch.
4. In body tissues as inosite or muscle sugar.

Starch is formed by the chlorophyll of the plant cell, under the action of the sun's rays, from the carbon dioxide of the air and the water drawn from the soil. The process is a complex one, but the net result may be shown by the following equation:

carbon dioxide + water = starch + oxygen

$$6\ CO_2 + 5\ H_2O = C_6H_{10}O_5 + 6\ O_2$$

or

Glucose

$$6\ CO_2 + 6\ H_2O = C_6H_{12}O_6 + 6\ O_2$$

Starch. — Starch is the most abundantly distributed in nature of any of the carbohydrates, for it is the chief form in which plants store their carbohydrate. It is found in fruits, seeds, roots, tubers, bulbs, stems, and leaves of various plants. In the United States the starch of commerce is obtained chiefly from corn.

Starch exists in the form of minute granules which are formed in the plant during its growth. The granules are composed of alternate layers of starch and cellulose, those of different plants having characteristic shapes which can be recognized by examination with a microscope. Owing to its wide distribution, and to the fact that it may be easily stored because it does not decompose readily, starch is the cheapest form of food and is often used to excess in the diet.

Structure of the Starch Granule. — Examine under the microscope and make drawings of starch granules from corn, potato, wheat.

Identification Test for Starch. — Mix a little starch and cold water, boil, and cool. Add a drop of iodine. The blue color which results is characteristic of starch. With raw starch, iodine gives a purple color.

EXPERIMENT 15. — Test various foods with iodine to ascertain whether they contain starch. Tabulate results.

Solubility of Starch.

EXPERIMENT 16. — Mix $\frac{1}{4}$ tsp. starch in $\frac{1}{4}$ c. cold water. Filter through filter paper. Test the filtrate and also the residue on the paper with iodine for starch. Did the starch pass through the filter? Is starch soluble in cold water?

EXPERIMENT 17. — Mix $\frac{1}{4}$ ts. starch in $\frac{1}{4}$ c. cold water. Heat to boiling. Filter. Test as above. Did any of the starch pass through the filter? Is starch at least partly soluble in boiling water? Examine some of the cooked starch under the microscope. Has any change taken place in the form of the granule?

EXPERIMENT 18. — Pour boiling water directly upon dry starch. Examine lumps. What caused them to form?

EXPERIMENT 19. — Mix starch with cold water and stir into boiling water. Did lumps form in the mixture? Give one method by which lumps may be avoided when starch is used to thicken a mixture.

Dextrin. — Before starch can be absorbed into the blood, to be utilized in giving heat and energy to the body or to be stored as fat, it must first be changed to a soluble carbohydrate or form of sugar. Before the final change to sugar takes place an intermediate product is formed called dextrin. This has the same chemical formula as starch $(C_6H_{10}O_5)_n$, but possesses different properties.

Dextrin may be formed (1) by the application of heat to dry starch, as in browning of flour; (2) it is the first change that occurs when the enzymes, ptyalin of saliva, amylopsin of the pancreatic juice, or diastase of sprouting grains, convert starch into sugar.

Identification Test for Dextrin. — Brown some flour without burning it, add water; shake well. Add a drop of iodine. The reddish brown color which results is a characteristic test for dextrin.

Experiment 20. — Mix some browned flour or well-browned toast with water. Let stand awhile. Filter. Test filtrate for dextrin.

Is dextrin soluble in cold water? Does it differ from starch in this respect?

Experiment 21. — Test the brown crust of bread, and also the white crumb of the center of the loaf, for dextrin.

Which is the more soluble, hence the more digestible, the crust or the crumb of bread?

Cellulose. — Cellulose forms the basis of the cell structure of plants. Cotton and linen fiber are nearly pure cellulose. Paper consists largely of cellulose. Cellulose, as a rule, is hard and dense and resists the action of the digestive juices, so that when taken as a food, it is excreted without having been changed by the digestive juices. The cellulose of young and tender plants may be in part digested. Cooking tends to soften cellulose, thus making vegetables, cereals,

and fruits more digestible; and it also disintegrates the starch granule, making the starch available as food.

While having but little nutritive value, cellulose is very beneficial in the diet, as it is a mechanical stimulus to the action of the large intestine, thus tending to prevent constipation. It also absorbs and dilutes the waste products formed during digestion. Uncooked cellulose should not be given in large amounts to young children.

METHODS OF USING STARCH AS A THICKENING AGENT

EXPERIMENT 22. — *Method* 1. *a.* Mix 1 tb. flour with 1 tb. water.
b. Mix 1 tb. flour with 2 tb. water.
c. Mix 1 tb. flour with 3 tb. water.

Stir each mixture until it is smooth, noting the time required to obtain results. State the proportion of water to be used with flour to form a smooth paste.

Boil ½ c. water, add some of the boiling water to part (*a*), stirring constantly. Pour this slowly into the rest of the boiling water, stirring until it thickens and is smooth.

Deduce a rule for using starch in the form of a powder, as a thickening agent. Let mixture cool and note how it forms a starch jelly.

EXPERIMENT 23. — *Method* 2. Rub to a smooth paste 1 tb. butter and 1 tb. flour. Boil ½ c. water, pour part of it on the butter and flour mixture to thin it. Pour this slowly into the rest of the boiling water, stirring until it thickens and is smooth.

Deduce a rule for using starch as a thickening agent when some fat is used.

EXPERIMENT 24. — *Method* 3. Melt 1 tb. butter, add 1 tb. flour; when well mixed, add ½ c. milk or water, stirring until it thickens and is smooth.

Deduce a second rule for thickening with starch when fat is used. Compare results with those of the two previous methods. Which mixture has the smoothest and richest texture?

Experiment 25. — Brown 1 tb. butter, add $1\frac{1}{4}$ tb. flour, and then brown them together; add $\frac{1}{2}$ c. water or soup stock, and cook until smooth.

Deduce method of making a brown sauce. How would you make a brown gravy for meats? Compare thickness of liquid with the previous experiments. Is more browned flour required for thickening? Why?

Meat and Vegetable Sauces are of two general varieties, white and brown, and from these many sauces may be prepared by varying the ingredients and the seasonings.

General Method of Making Sauces. — Melt the butter in a stewpan or double boiler, add the flour, and when well mixed, add the liquid. If the liquid is hot, add it one-third at a time, cooking each portion till thick and smooth. If the liquid is cold, it may all be added at once, stirring constantly until it thickens and is free from lumps. Add seasoning.

This method gives the finest quality of sauce, but methods of thickening 1 or 2 may be used when the liquid is already combined with the meat or vegetable.

PROPORTION OF FLOUR FOR SOUPS AND SAUCES

1 tb. flour ($\frac{1}{2}$ to 1 tb. butter) to 1 c. liquid for cream soups.
2 tb. flour (2 tb. butter) to 1 c. liquid for ordinary white sauce.
3 tb. flour (2 to 3 tb. butter) to 1 c. liquid for white sauce for creamed oysters, etc.
4 tb. flour (2 to 4 tb. butter) to 1 c. liquid for white sauce for croquettes, etc.

When flour is browned (dextrinized) for brown sauce, the amount used must be increased $\frac{1}{2}$ tb. for every cup liquid, as browning causes flour to lose some of its thickening power.

Cornstarch Pudding

Use method 1 of thickening with starch

5 tb. cornstarch	1 pt. scalded milk
$\frac{1}{4}$ c. sugar	$\frac{1}{8}$ ts. salt
$\frac{1}{4}$ c. cold milk	$\frac{1}{2}$ ts. vanilla

Scald milk in double boiler. Mix dry ingredients with the cold milk and stir this into remainder of hot milk. Cook fifteen minutes. Add vanilla. Pour into a mold wet in cold water; let stand till cold. Serve with sweetened and flavored cream, with boiled custard, or with cooked fruit. One half square melted chocolate may be added during the cooking.

At the end of five minutes remove 1 ts. of mixture, again at end of ten minutes, and at end of fifteen minutes. Compare the taste of the three samples. How long should cornstarch mixtures be cooked? Why does the pudding thicken as it cools?

CEREALS

The grains used chiefly in the United States for breakfast foods are corn, oats, wheat, and rice.

Corn is a native American grain and is the most abundant food product grown in the United States. It furnishes more nourishment for the money expended than most of our other foods and, if well cooked, can be made into many palatable dishes.

From corn are prepared cornstarch, corn meal, corn flour, hominy, samp, hulled corn, and some "ready-to-eat" cereals, such as corn flakes.

Oats are grown in northern regions and are used extensively for porridge and, in Scotland, for oat cakes. The old-fashioned oatmeal, which was sold in uncooked form and had much of the husk left on it, had to be cooked several hours; the modern preparations, such as rolled oats, for example, are steamed and while still moist the grains are

passed between hot rollers; they are, therefore, partially cooked and require less cooking in the home. Oats are rich in fat, and therefore make a good food for winter.

Wheat, when finely ground, is the most important of bread stuffs, but it is also used extensively as a breakfast food. Cracked wheat is the crushed grain with part of the bran left on it and should be cooked for several hours. Special parts of the wheat grain are used in preparing various breakfast foods. Some breakfast foods are prepared from a dough made of wheat flour, baked, then dried and toasted.

From wheat are prepared graham, entire wheat, and white flour of various grades, many breakfast foods, macaroni, spaghetti, etc.

Rice is a grass native to India. It is the staple food in all tropical and semi-tropical regions, and is much used elsewhere. It is said to form the main food of one-third of the human race. Being deficient in fat and protein, it usually is supplemented with foods rich in these two food principles.

TABLE OF COMPOSITION OF CEREALS (ATWATER)

	Water	Protein	Fat	Carbohydrates	Ash
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Entire wheat flour	11.4	13.8	1.9	71.9	1.0
Graham flour	11.3	13.3	2.2	71.4	1.8
White flour (medium)	12.0	11.4	1.0	75.1	0.5
Wheat breakfast food	9.6	12.1	1.8	75.2	1.3
Corn meal	12.5	9.2	1.9	75.4	1.0
Oat breakfast food	7.7	16.7	7.3	66.2	2.1
Rice	12.3	8.0	0.3	79.0	0.4
Rye flour	12.9	6.8	0.9	78.7	0.7
Macaroni	10.3	13.4	0.9	74.1	1.3

Cooking of Cereals. — The chief purposes of cooking cereals are:

(1) To sterilize them.

(2) To improve flavor and appearance.

(3) To hydrate the starch and cellulose and rupture the tissues, in order to make them more easily digestible.

As cereals contain from 66 to 79 per cent of starch and but 7 to 12 per cent of water, they must be cooked in several times their volume of water. Add $\frac{1}{2}$ ts. salt for every pint of water used.

TABLE FOR COOKING CEREALS

	Amount Dry Cereal	Amount Water	Time of Cooking
Rolled Oats	1 c.	2 c.	$\frac{1}{2}$ to $\frac{3}{4}$ h.
Rice	1 c.	2 to $2\frac{1}{2}$ c.	1 h.
Cream of wheat	$\frac{3}{4}$ c.	4 c.	$\frac{3}{4}$ h.
Corn meal	$\frac{3}{4}$ c.	4 c.	2 h.
Coarse oatmeal	1 c.	4 c.	3 h.

General Method of Cooking Cereals. — In the upper part of a double boiler put the required amount of water and salt. When the water boils, add the cereal slowly, stirring constantly. Cook for five minutes directly over the fire. Place the upper boiler in the lower part of double boiler containing boiling water, cover and cook the required time without stirring. All cereals must be thoroughly cooked.

Corn Meal Mush

Moisten the corn meal with $\frac{1}{2}$ c. of cold water before stirring it into the boiling water, to avoid having the mixture lumpy. Serve the mush hot, or put into square molds, or baking powder cans, and, when cold, remove from molds, slice, roll in flour, and sauter in hot fat.

To wash Rice. — Always wash rice before using it, by putting it into a strainer and putting the strainer in a bowl of cold water, changing the water often until it is clear; this removes the loose starch and prevents the rice from becoming pasty in cooking.

Baked Rice

Steam 1 c. rice, $\frac{1}{2}$ ts. salt in $2\frac{1}{4}$ c. stock or water, 1 h.; add 1 c. tomato, 2 tb. butter, $\frac{1}{4}$ ts. paprika, or a little chopped green pepper, $\frac{1}{2}$ ts. curry powder. Cook fifteen minutes. Put into buttered baking dish, cover top with buttered crumbs, and bake till brown, about twenty minutes. Curry powder may be omitted and grated cheese to taste added in its place.

Home-made "Ready-to-eat" Cereals. — Heat white, rye, or entire-wheat bread slowly in the oven until thoroughly dry and a golden brown in color; cool and crush with a rolling pin. This is equal in flavor and digestibility to many of the breakfast foods on the market and may be prepared at much less cost. Serve with milk or cream.

AMOUNT OF CEREAL OBTAINED FOR TEN CENTS

(*To be prepared by student*)

Cereal	Price per lb.	No. lb. for 10 Cents	Total Amounts		
			Protein	Fats	Carbohydrates
			% of lb.	% of lb.	% of lb.
1. Cornmeal . .	.02	5	46	9.5	377.0
2.					
3.					
4.					
5.					

Weigh "ready-to-eat" breakfast foods and compute

the cost per pound paid for the cereal when so prepared for the market.

To serve Cereals. — As cereals are about three-fourths starch, it is not necessary to add sugar, which is but another form of carbohydrate, except as a flavor. As they are deficient in fat, cream is a valuable addition. Milk increases both the amount of fat and protein. If fruits are served with cereals, they supply organic acids, in which the cereals are deficient, as well as mineral matter and sugar.

Fruits to serve with cereals:

1. Baked apples
2. Stewed prunes
3. Berries
4. Sliced bananas
5. Peaches
6. Figs or dates, cut in pieces, may be stirred into the cereal before it is taken from the fire

NOTE. — Put grains of corn, oats, rye, in wet cotton; place them where they will get sunshine and keep them well moistened until the grains sprout. Note carefully any changes in the grains and in the consistency of their starch content. Why does nature store the various food principles in the grains? What part of the plant is the grain? Plant some of the grains in earth in flower pots and let them grow to maturity.

CHAPTER IV

VEGETABLES

COMPOSITION OF VEGETABLES (ATWATER)

	Refuse %	Water %	Protein %	Fat %	Carbohydrates %	Ash %
Beans, dried		12.6	22.5	1.8	59.6	3.5
Beans, lima, fresh-shelled		68.5	7.1	.7	22.0	1.7
Beans, string	7.0	83.0	2.1	.3	6.9	.7
Beets	20.0	70.0	1.3	.1	7.7	.9
Cabbage	15.0	77.7	1.4	.2	4.8	.9
Celery	20.0	75.6	.9	.1	2.6	.8
Corn, green edible portion		75.4	3.1	1.1	19.7	.7
Cucumbers	15.0	81.8	.7	.2	2.6	.4
Lettuce	15.0	80.5	1.0	.2	2.5	.8
Mushrooms		88.1	3.5	.4	6.8	1.2
Onions	10.0	78.9	1.4	.3	8.9	.5
Parsnips	20.0	66.4	1.3	.4	10.8	1.1
Peas, dried		9.5	24.6	1.0	62.0	2.9
Peas, fresh-shelled		74.6	7.0	.5	16.9	1.0
Potatoes	20.0	62.6	1.8	.1	14.7	.8
Rhubarb	40.0	56.6	.4	.4	2.2	.4
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9
Spinach		92.3	2.1	.3	3.2	2.1
Squash	50.0	44.2	.7	.2	4.5	.4
Tomatoes		94.3	.9	.4	3.9	.5
Turnips	30.0	62.7	.9	.1	5.7	.6
Vegetables, canned						
Baked beans		68.9	6.9	2.5	19.6	2.1
Peas, green		85.3	3.6	.2	9.8	1.1
Corn, green		76.1	2.8	1.2	19.0	.9
Succotash		75.9	3.6	1.0	18.6	.9
Tomatoes		94.0	1.2	[4] .2	4.0	.6

AMOUNT OF NUTRIENTS OBTAINED FOR TEN CENTS

(*To be prepared by student*)

Price Vegetable per lb.	No. of Lbs. for 10 cts.	Total Amounts		
		Protein % of lb.	Fats % of lb.	Carbohydrates % of lb.

General Composition of Vegetables. — Vegetable foods, with the exception of cereals, legumes, and nuts, contain a large amount of water, hence a small amount of solid nutrients. Young, fresh vegetables contain a sufficient amount of water to hydrate the starch and cellulose content, and so may be cooked without the addition of water. Vegetables contain but a small amount of protein, their principal solid being a carbohydrate, either in the form of starch, sugar, pectin, or cellulose. They contain mineral matter which is highly important in the diet.

PARTS OF PLANTS USED FOR FOOD

Seeds — Peas, beans.

Roots — Beets, carrots, turnips, parsnips, radishes, sweet potatoes, salsify.

Tubers — White potatoes, Jerusalem artichokes.

Bulbs — Onions, garlic, shallots.

Stems — Asparagus, celery, chives, rhubarb.

Leaves — Cabbage, lettuce, Brussels sprouts, beet greens, water cress, spinach.

Flowers — Cauliflower.

Fruit — Wheat and the grains, cucumbers, tomatoes, egg plant, squash.

Fungi — Mushrooms, puff balls.

To prepare Vegetables for Cooking. — Vegetables should be thoroughly cleaned before being cooked. A small scrubbing brush will help to clean potatoes thoroughly and quickly. If vegetables are wilted, they should be soaked in cold water before cooking. Vegetables that are to be eaten raw, as lettuce and celery, must be cleaned with great care, as the dirt which adheres to them may contain disease-producing bacteria. Radishes and other small vegetables may be dipped quickly into boiling water to destroy bacteria and then into ice water to make them crisp. Cabbages, cauliflower, Brussels sprouts should be soaked, heads down, in cold water containing salt or a little vinegar, which will drive out insects that may be present in them.

General Method of Cooking Vegetables. — Most of the fresh vegetables should be put into boiling salted water to cook, the amount of water used varying with the amount present in the vegetable to be cooked. Tomatoes do not require the addition of any water, and spinach may be cooked with the water left on the leaves after washing. Green vegetables should boil rapidly during the cooking, but for potatoes the boiling should be gentle, that the vegetable may not be broken. To prevent them from being watery, the boiling should be uninterrupted. All vegetables should be well cooked, but they should remain firm, except for soups. They should be thoroughly drained, and such vegetables as spinach, cabbage, and turnips should be pressed lightly to remove part of the water. Peas and beans cannot be cooked tender in hard water, hence the salt should be added during the last part of the cooking. A very small amount of soda may be added to the water in which the beans and peas are cooked to soften the water. Vegetables are cooked to soften the cellulose, to cause the starch granules to swell and burst, to coagulate the protein, and to develop flavor.

Potatoes. — Potatoes are native to South America and were brought from there to North America. They were introduced into Europe by the Spaniards in the sixteenth century, into Ireland by Sir John Hawkins in 1565, and into England by Sir Walter Raleigh in 1586.

Potatoes belong botanically to the same family as the tobacco and deadly nightshade. They contain a bitter juice called solanine, which lies in and near the skin. This is drawn out into the water when they are boiled or is given off in the steam when they are baked. For this reason the custom of using for bread making the water in which potatoes have been boiled is not desirable. If potatoes have to stand after being baked, they should be pierced with a fork to allow the steam to escape.

As potatoes are deficient both in protein and in fat, they are usually eaten with milk, eggs, etc., and with some form of fat. The protein of potatoes is largely in the form of albumen which, with the mineral matter, is dissolved in the moisture or juice. As albumen is soluble in cold water, there is an appreciable loss of it when the potatoes are peeled, cut in pieces, and soaked in cold water. When potatoes are placed in boiling water, the starch granules swell and burst and absorb the juice, the albumen coagulates, or is absorbed by the starch, and the mineral matter also is retained.

Potatoes should be kept in a dry, cool place, and any sprouts which may appear should be removed.

Boiled Potatoes

Wash and peel potatoes, put them into boiling salted water, using 1 ts. salt to every quart of water. Cook about thirty minutes or until tender. *Drain well.* Put the kettle, uncovered, on the back of the stove and shake it gently to allow the steam to escape

and make the potatoes mealy. Cover the kettle with a towel, which will keep them hot and absorb the steam.

Mashed Potatoes

Mash potatoes in the kettle in which they were boiled, beating until light with a wire potato masher, and moistening with hot milk. Add 1 or 2 tb. butter, ½ ts. salt, and a speck of pepper to every pint of potatoes. When beaten until white, creamy, and free from lumps, pile them lightly in a warm vegetable dish. Serve very hot.

Baked Potatoes

Select smooth potatoes of uniform size. Wash and scrub them well. Place in a *hot* oven and bake until soft, about forty-five minutes. Serve at once in an uncovered dish. If they must stand, pierce with a fork, or break the skin, to let the steam escape.

Potatoes are more digestible when baked than when cooked in any other way, as the intense heat changes some of the starch to dextrin, and all the mineral matter and other constituents are retained.

Escalloped Potatoes

Wash, peel, and slice raw potatoes. Put in layers in a baking dish, sprinkling each layer with salt, pepper, flour, and bits of butter; add milk to nearly cover. Cover the dish and bake 1½ h. or till the potato is soft. Uncover the baking dish during the last half hour of baking to brown the potatoes well.

Warmed-over Potatoes (Boiled)

Lyonnaise Potatoes

1 pt. cold boiled potatoes, cut into quarter inch cubes
½ ts. salt
½ ssp. pepper
2 tb. minced onions
2 tb. drippings or lard
1 tb. chopped parsley

Sprinkle the potatoes with the salt and pepper. Fry the onion

till a light brown in the drippings, add the potatoes; stir with a fork until they are brown; add the parsley and serve. 1 tb. vinegar may be added.

Stewed Potatoes

1 pt. cold boiled potatoes, diced
½ c. milk
½ ssp. pepper
1 or 2 tb. butter
½ ts. salt
1 ts. chopped parsley

Heat the milk, add the butter and seasoning and the potatoes. Simmer gently until the milk is absorbed. Sprinkle with parsley and serve.

Creamed Potatoes

Cut one scant pint potatoes into one-fourth inch dice, sprinkle them with ½ ts. salt, ½ ssp. pepper; add them to 1 c. white sauce, and when well heated, sprinkle with 1 tb. chopped parsley and serve.

Potatoes au Gratin

Slice 3 c. potatoes, sprinkle with 1 ts. salt and 1 ssp. pepper. Make 1 pt. white sauce. Put potatoes and sauce in alternate layers in a baking dish, having sauce for the top layer. Cover with buttered crumbs. Bake twenty-five minutes or until brown. Grated cheese, chopped green pepper, sliced hard-boiled eggs, or 1 tb. minced onion may be added to the layers.

To butter crumbs. — To 1 tb. melted butter, add ¾ c. fine bread crumbs. Mix well.

Hashed Brown Potatoes

Chop 1 pt. cold boiled potatoes, season highly with salt and pepper, moisten them with ½ c. white sauce. Put 1 ts. lard and butter mixed in a thick iron frying pan; when hot, put in the potatoes and flatten into a cake. Cook slowly, without stirring, keeping the pan covered until a brown crust forms, about twenty minutes. Fold once and turn on to a hot platter.

Warmed-over Potatoes (Mashed)

Shape cold mashed potatoes into small round cakes about one-half inch thick. Brush with milk or egg beaten with a little milk, and bake in a hot oven until brown. Or, roll the cakes in flour and sauter in hot fat, browning both sides.

Potato Puff

To 1 pt. mashed potatoes, add $\frac{1}{2}$ c. milk, 2 tb. butter, more salt and pepper if needed, 1 tb. chopped parsley, $\frac{1}{2}$ ts. onion juice, cayenne, or paprika to taste, and 1 beaten egg. Pile lightly in a baking dish and bake in a hot oven until brown, about twenty minutes. Serve in the dish in which it is baked.

To chop parsley. — Wash parsley, remove the leaves, and dry in a towel or absorbent paper. Place on a board, gather the leaves closely between thumb and finger, and cut through. If the point of the knife is held firmly on the board, a circular and also a chopping motion can be given to it at the same time.

To mince onions. — Remove the brown outer covering of the onion about halfway down; score the top of the onion in gashes about one-eighth of an inch apart; score again at a right angle, then slice across the onion.

Experiment 26. — Test turnip with iodine for starch. Is the carbohydrate present in the form of starch?

Turnips. — Turnips are at their best in the fall and early winter; toward spring they become tough and fibrous and are only good for flavoring and for stews. The flat purple-topped turnip, the rutabaga, a large yellow turnip, and the large French turnip are the best varieties. Turnips should not be overcooked, or they will become dark in color and strong in flavor. The summer turnip, when sliced, can be cooked in thirty minutes, the winter turnip in from forty-five to sixty minutes.

To prepare turnips. — Wash and pare the turnips, and if they are to be boiled and mashed, slice them.

To boil and mash turnips. — Prepare as above and cook in boiling salted water until tender. Drain well. Mash with a wooden masher and season with salt, pepper, and butter. Serve at once.

Creamed Turnips

After washing and peeling, cut the turnips into one-fourth inch dice; cook in boiling salted water until tender. Drain well. To every pint of turnips, add one cup of white sauce. Reheat and serve.

Turnip Cups with Creamed Pea Filling

Select small, round turnips. Wash, pare, and cut a slice from the large end, so they will stand. Scoop out the inside, forming cups with walls about one-fourth inch thick. Cook in boiling salted water until tender, about thirty minutes. Drain well and fill each cup with peas, heated in a seasoned white sauce. Sprinkle with chopped parsley and serve hot.

Experiment 27. — Test carrot with iodine for starch. Is the carbohydrate present in the form of starch?

Carrots. — When carrots are boiled in water, large amounts of their carbohydrate, in the form of sugar, and of their protein, in the form of albumen, are lost in the water. They are of value as a food because of their flavor and because of their cellulose, which aids in the process of digestion.

To prepare carrots. — Carrots need not be peeled; after being well scrubbed they should be scraped with a knife; young carrots may not need even to be scraped.

Carrots in Bechamel Sauce

Prepare carrots and cut in one-fourth inch dice, or in thin strips about the size of a match and one inch long. Cook in boiling salted

water until tender; drain, and reheat in one-half their bulk of Bechamel Sauce.

Bechamel Sauce

Melt 2 tb. butter, add 2 tb. flour; stir in $1\frac{1}{2}$ c. milk, as in white sauce; add $\frac{1}{3}$ ts. salt, $\frac{1}{2}$ ssp. pepper. When it has thickened, add the beaten yolks of 1 or 2 eggs.

To add yolk of egg to a hot liquid. — Beat the yolks slightly, add some of the hot liquid to them until thin enough to pour; stir into the remainder of the hot liquid and cook until the egg thickens the mixture slightly, but do not let the mixture boil, or the sauce will separate.

Tomatoes. — The tomato is probably a native of Mexico or Peru. There are several varieties, some having red and others having yellow fruit. While the tomato is largely water and hence has a low nutritive value, it forms one of our most useful vegetables. When overcooked, the tomato becomes dark in color and the flavor is impaired.

To prepare tomatoes. — Pour boiling water over them and remove the skins. If they are to be served raw, do not pour the hot water on them, but rub the skin with the back of a knife, when it will come off easily.

Stewed Tomatoes

Peel tomatoes, slice, and cook until they are tender, which will be about twenty minutes. About five minutes before the cooking is finished, season, using 1 ts. salt, 1 ts. sugar, 1 tb. butter, and $\frac{1}{2}$ ssp. pepper for every quart tomatoes. Small pieces of bread may be added if desired.

Creamed Tomatoes

Peel and slice two tomatoes, sprinkle with salt and pepper, and sauter in 2 tb. hot butter; when soft, put the slices on a serving dish and keep warm. Put 1 c. milk in the pan in which the toma-

toes were cooked, thicken with 2 tb. flour according to Method 1 for thickening. Season and pour over the tomatoes. Serve hot. 1 pt. milk and 4 tb. flour may be used if more sauce is desired.

Stuffed Tomatoes

Wipe and remove slices from the stem ends of six medium-sized tomatoes. Remove seeds and pulp, salt the insides of the tomatoes well, invert them, and let stand while the other ingredients are being prepared. Cook 1 tb. minced onion and 3 tb. chopped bacon five minutes, add $1\frac{1}{2}$ c. bread crumbs, $\frac{1}{2}$ c. chopped meat, and the tomato pulp and cook five minutes. Season with salt and pepper. One egg slightly beaten may be added. Fill the tomatoes with the mixture, sprinkle with buttered crumbs (and a little sugar, if desired), and bake until brown, about twenty minutes. The chopped meat may be omitted.

Stuffed Green Peppers

Remove the stem end from the peppers and take out *all* the seeds and partitions. Remove small slices from the blossom ends so that they will stand. Cover peppers with boiling water, allow to stand five minutes and drain. Use the same stuffing as for tomatoes. Bake one-half hour in moderate oven, basting with a little hot water or stock. Boiled rice may be used in place of bread crumbs.

Experiment 28. — Test onion with iodine for starch; with Fehling solution for sugar. In what form is the carbohydrate found in onions?

Onions. — The onion is a native of the Himalaya Mountains. It contains an essential, volatile oil which gives it the characteristic odor and flavor; when eaten, this oil is absorbed by the blood and brought to the lungs, so the odor will remain for some time on the breath. The onion is considered a wholesome, if not a highly nutritious vegetable and

is of value because of its stimulating action upon the digestive tract.

Boiled Onions

Peel the onions under cold water. Put them into a sauce pan of boiling water, boil five minutes, drain; cover again with boiling water, cook ten minutes, drain; re-cover with boiling water, add 1 ts. salt to every quart water and cook until tender, about forty-five minutes. Drain, add milk in desired amount, and thicken with 2 tb. butter and 2 tb. flour (Method 2 for thickening) for every cup milk. Season and serve.

Boiled Cabbage

Remove outer leaves, cut cabbage in quarters and soak one-half hour in cold water with 1 tb. salt. Put into a large kettle nearly filled with rapidly boiling water, add $\frac{1}{4}$ ts. soda. Cook twenty minutes uncovered; drain, cover again with boiling water, add 1 ts. salt to every quart water. Cook twenty minutes or until tender, but do not overcook. Drain and serve as desired. A white sauce may be poured over it, or salt, pepper, and butter may be added.

Escalloped Cabbage

Put alternate layers of chopped boiled cabbage, white sauce, and grated cheese in a baking dish. Cover with buttered crumbs and bake twenty minutes, or until brown.

Beans. — Beans and peas being richer in protein than any other vegetable food are often used as substitutes for meat; being deficient in fat, salt pork or some other fat may be added in the cooking. Dried beans are more easily digested if the skin is removed. Beans and peas, as before stated, do not cook tender in hard water and a little soda added to the water in which they are first boiled will help soften them.

Baked Beans

Soak 1 qt. pea beans over night. Drain, cover with fresh water, add 1 ssp. soda, and boil about twenty minutes. Drain. Boil $\frac{1}{4}$ lb. salt pork twenty minutes. In the bottom of a bean pot put 1 whole onion, the salt pork, then the beans. Mix $\frac{1}{2}$ ts. mustard, 3 ts. salt in $\frac{1}{2}$ c. molasses and pour over the beans. Cover beans with the water in which the pork has boiled. Cover the crock closely and bake in a very slow oven from four to six hours. Add water as needed, keeping them nearly covered with water until the last hour of baking.

Succotash

1 pt. fresh lima beans
1 pt. corn cut from cob
2 tb. butter or 2 oz. salt pork
salt and pepper
1 c. milk

Cook beans and pork in boiling water thirty minutes, add $\frac{1}{8}$ ts. soda, boil one minute, and drain.

Remove corn from cob by scoring down the center of each row of kernels, pressing out pulp with the back of the knife, leaving the skins on the cob. Add the corn to the beans, and the milk (and butter if used), and cook fifteen minutes; add salt and pepper and cook five minutes longer. Serve.

Succotash may also be made from dried corn and beans, soaked over night and cooked several hours with a piece of salt pork.

Corn Fritters

1 pint corn, grated or removed from cob as above, or if canned, chopped fine. Canned Kornlet is ready to use for fritters. Add to the corn 6 tb. flour, 1 ts. salt, $\frac{1}{2}$ ssp. pepper, beaten yolks of 2 eggs. If canned corn is used, it may be necessary to add 2 tb. milk. Fold in beaten whites of 2 eggs. Sauter by dropping by tablespoonful into hot lard, browning on both sides. Serve on a warm platter, but do not pile them one on another. One-half ts. baking powder may be substituted for 1 egg.

Macaroni. — Macaroni is served as a vegetable. It is

made from a wheat flour rich in gluten. When cooked with cheese and milk, it forms a highly nutritious food. It is the staple food of the Italians. As a preliminary to any of the many methods of preparation, macaroni should be cooked until tender in boiling salted water, which will require about thirty minutes.

Baked Macaroni and Cheese

Put in a baking dish alternate layers of boiled macaroni, white sauce, and grated cheese. Season the sauce with salt, cayenne, and mustard. Put buttered crumbs over the top and bake about thirty minutes, or till well browned.

Macaroni and Tomato Sauce

Reheat boiled macaroni in tomato sauce. Variety can be secured by sprinkling the macaroni with grated cheese; or all may be put into a baking dish, covered with buttered crumbs, and baked till brown.

Tomato Sauce

1 pt. stewed tomatoes
1 slice onion
¼ bay leaf
1 sprig parsley

Cook ten minutes; strain. Make a sauce, using 2 tb. butter, 2 tb. flour, and the strained tomato. Season with ½ ts. salt and ½ ssp. pepper.

CHAPTER V

SUGAR AND FRUITS

PLANTS store their carbohydrates in part in the form of sugar. Cane sugar, or sucrose ($C_{12}H_{22}O_{11}$), was formerly obtained almost entirely from the sugar cane, but now the largest amount of sugar on the market comes from the sugar beet. Chemically, cane sugar and beet sugar have the same properties and cannot be distinguished. In the refining of sugar the juices of the cane or beet are extracted by crushing and pressure, and then go through a process of purification; the resulting liquid is boiled down to a state of crystallization. As all the sugar will not crystallize, this liquid is drained off and constitutes molasses. When heated, cane sugar melts and forms barley sugar, and at a still higher temperature, caramel is formed; this latter has a brown color and distinctive flavor and is used for coloring and flavoring in cookery. Sugar loses part of its sweetness by this process.

Maple sugar ($C_{12}H_{22}O_{11}$) is obtained by boiling down the sap of the maple tree.

Lactose or *milk sugar* ($C_{12}H_{22}O_{11}$) is present in the milk of all mammals. It is the form of carbohydrate that is best for a young child until it is a year old. Lactose is obtained commercially from the whey left as a residue in cheese making. It is not as sweet as cane sugar. When milk is modified for infant feeding, lactose is the form of sugar which should be added.

Glucose or *grape sugar* ($C_6H_{12}O_6$) is widely distributed in

nature and is found in fruits and plant juices, and in small amount in the blood of animals. It is not as sweet as cane sugar and does not crystallize as readily. It is usually sold in the form of a clear, heavy syrup.

Glucose is obtained commercially by treating starch with an acid, which causes the following change to take place:

$$C_6H_{10}O_5 + H_2O = C_6H_{12}O_6$$

Cane sugar is inverted, or changed to glucose, when boiled with an acid. Acid fruits which are cooked for some time with sugar are, therefore, not as sweet as when the same amount of sugar is added after cooking. Glucose will ferment with the action of yeast, but cane sugar must first be changed to glucose by the enzyme of yeast before fermentation will take place.

NOTE. — Show samples of cane sugar, beet sugar, milk sugar, glucose.

EXPERIMENT 29. — Put $\frac{1}{4}$ c. sugar in an omelet pan and stir over a moderate fire until it melts. Remove a portion of the syrup, which is barley sugar. Continue the heating until the mixture browns slightly. Pour all but a small amount of this on an ungreased tin to cool. This is caramel. Continue heating a small amount of the sugar until it burns or carbonizes.

EXPERIMENT 30. — Pour sulphuric acid (H_2SO_4) on a small amount of dry sugar. The acid will remove the water (H_2O). What other element is present in sugar? Repeat experiment with glucose.

Fehling Solution. — Five cubic centimeters of copper sulphate solution, 5 cubic centimeters of alkaline Rochelle salts, 20 cubic centimeters of water.

Boil all together for two minutes.

Identification Test for Glucose. — Fehling solution will change from a blue color to a copper brown when boiled with glucose; it will not so change when boiled with sucrose or cane sugar.

Experiment 31. — Mix a little glucose and water. Add a small amount of Fehling solution and boil.

Experiment 32. — Mix a little cane sugar and water. Add a small amount of Fehling solution and boil. There will be no change of color if the sugar is pure and the Fehling solution has been freshly mixed.

Experiment 33. — Test the juices of various fruits or small pieces of vegetables boiled in water with Fehling solution. In what form of sugar do many of the plants store part of their carbohydrates?

Candy Making. — See experiments with boiling sugar under "Boiling," page 15.

Fondant

Mix 2 c. sugar and $\frac{3}{4}$ c. water. Put in a stewpan and heat. As it begins to boil, wipe down the sides of the kettle with a wet cloth. Sprinkle on $\frac{1}{4}$ ts. cream of tartar and let it boil in, but do not stir the syrup. Cover the kettle for a minute or two or until the steam comes out around the cover. Remove cover and cook syrup to 238° F. or until it forms a soft ball when tested in ice water. Pour syrup on a slightly dampened platter and let stand without disturbing until all the heat has left it. Work back and forth with a wooden paddle or knife until the mixture creams. Knead into a smooth ball. Put into a closely covered fruit jar until ready to use. The quality of the fondant improves upon standing, but it must be kept in a cool, dry place and be closely covered.

To shape. — Add desired flavoring, nuts, etc., to fondant and knead until mixed. Shape as desired, putting candies as formed on white table oilcloth or on paraffine paper.

To coat with chocolate. — Melt unsweetened chocolate over hot water, adding a few shavings of paraffine; remove from water and let cool a little. Dip fondant balls into it, using a fork; drain off as much chocolate as possible and put candies on white oilcloth or marble slab. Let stand until firm.

Cream Mints

Melt fondant over hot water, stirring constantly; flavor with peppermint or wintergreen to taste, and add desired coloring. Drop from the tip of a spoon on to oilcloth or paraffine paper. If the mixture becomes too thick, add a few drops of boiling water.

NOTE. — Weigh candies and compute their cost.

FRUITS

COMPOSITION OF FRUITS (OLSEN)

	WATER %	SUGAR %	PROTEIN %	ACID %	ASH %
Apples	85.4	11.27	0.64	0.7	0.27
Bananas	73.8	21.7	1.17	0.3	0.5
Blackberries	86.3	10.9	1.3	0.77	0.5
Cranberries	88.9	9.9	0.4	2.34	0.2
Grapes	80.12	16.5	1.26	0.59	0.5
Huckleberries	81.9	16.5	0.6		0.3
Lemons	88.0	0.37		5.39	
Oranges	86.0	5.65		1.35	
Peaches	88.0	10.8	0.7	0.56	0.7
Pineapples	85.19	12.22	0.48	0.77	0.42
Plums	78.4	13.25	0.4	1.0	0.52
Strawberries	90.0	7.0	0.9	1.1	0.6
Raspberries	84.0	12.6	1.7	1.48	0.6

Fruits are composed largely of water; their solids consist of carbohydrates, a small amount of protein, and some mineral matter. Although their food value is low, fruits form a very valuable addition to the diet, for they contain mineral matter in an organic form in which it can be readily absorbed by the system. Their organic acids have medicinal properties and can also be oxidized in the human system to provide heat and other forms of energy. Fruits differ from vegetables in that their carbohydrates are largely in the form of sugar, hence they can be eaten without cooking; cooking,

however, softens the cellulose, thus making the fruit more digestible.

Care and Preparation of Fruits. — The decay of fruits is due to the action of bacteria, their wilting to the loss of water; they should, therefore, be kept in a cool, dry place. Large fruits, as pears and peaches, should be wrapped separately in paper, that they may not be bruised. Fruits may be kept in good condition for some months by being placed in cold storage. As there is danger of harmful bacteria clinging to fruits, especially to those that have been transported long distances or that have been exposed to the dust of the streets, all fruit that is to be eaten raw should be first carefully washed.

Dried fruits regain their original bulk and, in part, their flavor, when soaked in water, and they form a relatively cheap source of fruit supply during the winter months. Preserved fruits, jams, and jellies also form a valuable addition to the winter diet.

Pectin. — Another constituent of fruits is pectin, which causes the juices to form a jelly when boiled with sugar. Pectin is a carbohydrate and is at its best when fruit is just ripe, or a little before it ripens. If fruit is overripe, or if the juice ferments, or if it is boiled too long with the sugar in making jelly, the pectin undergoes a chemical change and loses its power of jellying. Pectin will produce jelly only in the presence of a definite amount of organic acid, one-half per cent of acid being about the amount required to make a good jelly; hence, fruits which contain but little acid must be made into jelly before they are ripe, or be cooked with acid fruits, or some lemon juice or cream of tartar be added to them.

Identification Test for Pectin. — Mash the fruit, warm, and strain through a cheesecloth. Put a small amount of juice in a test tube

and add an equal volume of alcohol; shake well and let stand. The pectin will settle out in a gelatinous precipitate.

EXPERIMENT 34. — Test various fruits, noting the amount and quality of the precipitate.

Apples. — The apple is a native of Asia, the crab apple being the original or wild apple. The Romans used apples centuries ago. The apple is one of our most wholesome fruits, eaten either raw or cooked. Some of the best known varieties are named here.

Cooking apples: Greening, Northern Spy, Baldwin, Maiden Blush.

Eating apples: Snow, Bellflower, Rambo, etc.

Apple Sauce

Pare and slice 6 tart apples into a granite stewpan; add 1 c. water. Cover kettle and cook until apples are soft, add sugar and nutmeg to taste. Mash, or put through a colander as desired. $\frac{1}{2}$ ts. butter may be added for flavor.

Dried Apple Sauce

Pick over and wash the dried apples and soak in cold water over night. Cook until soft in the water in which they were soaked. Mash, sweeten to taste, and flavor with lemon juice.

Baked Apples, No. 1

Select apples of uniform size; wash and core. Put into baking dish, cover bottom of dish with water. Bake for about thirty minutes, basting occasionally. They may be served with breakfast foods.

Baked Apples, No. 2

Core and pare apples; put in a baking dish, fill the centers of the apples with sugar, add a small piece of butter; cover the bottom

of the pan with water. Bake until tender, basting often. After taking from oven, sprinkle lightly with cinnamon and granulated sugar, or put red jelly in the centers.

Apple Compôte

Pare and quarter four apples. Make a syrup with $1\frac{1}{2}$ c. sugar and $1\frac{1}{2}$ c. water. Boil five minutes. Cook the apples in the syrup until tender, but do not let the pieces break. Remove the apples and put in a mold. Soak $\frac{1}{4}$ box gelatine in $\frac{1}{2}$ c. cold water, add to the hot syrup, and stir till dissolved. Add the juice and grated rind of $\frac{1}{2}$ lemon, pour mixture over the apples, and let stand until firm. Remove from mold and serve with cream sweetened and flavored with vanilla.

Cranberries. — Cranberries are the fruit of a small shrub which grows in marshy ground. They ripen in October and are valuable because of their excellent keeping qualities. Some of the best varieties are grown on Cape Cod and in New Jersey. Cranberry bogs are also found in Michigan and other parts of the country.

Cranberry Sauce

Wash and look over 1 pt. cranberries. Put them in a stewpan with 1 c. sugar and $\frac{3}{4}$ c. water; cover the pan and let them boil ten minutes without stirring; remove the scum and let them cool.

Cranberry Jelly

Wash and look over 1 qt. cranberries. Cook with 2 c. water twenty minutes; strain; add 2 c. sugar and boil five minutes or until it jellies. Pour into a mold and let stand until it is firm.

CHAPTER VI

FOOD PRESERVATION

Classification of Plants. — 1. Green plants contain chlorophyll grains in their leaves, which give them the power of converting the carbon dioxide of the air and water from the ground into carbohydrates. They feed upon inorganic substances in the soil in which they grow.

2. Colorless plants or fungi do not contain chlorophyll grains. They feed upon organic substances in presence of warmth and moisture.

Classification of Fungi. — 1. Higher fungi include mushrooms, toadstools, wood fungi, etc.

2. Molds consist of a dense mass of fibers. They produce spores or reproductive bodies which sometimes float in the air, settle upon organic substances and, if kept warm and moist and out of the sunshine, will grow and produce mold over the surface of the substance upon which they have settled.

3. Yeasts are visible only under the microscope. They are single-celled organisms, oval in shape. They reproduce by budding, producing a change in certain organic substances called alcoholic fermentation, by which alcohol and carbon dioxide are formed.

4. Bacteria are visible only under the microscope. They are much smaller than yeast plants. They are single-celled organisms, round, rod-shape, or spiral. They reproduce by fission, that is, by dividing in the middle, producing two

individuals, or by spore formation. Bacteria are very abundant, being found everywhere. Some are disease-producing; many are non-disease-producing.

Most organic foods are injured or in time destroyed by the presence in them and growth of molds, yeast, and bacteria. To preserve food the growth of these organisms must be prevented. Fresh air and sunshine are nature's disinfectants and they check the growth of germs or even destroy them; hence the necessity of fresh air and sunshine in all parts of a house.

Molds, yeast, and bacteria are destroyed by heat and by certain chemicals. Their growth is checked by low temperature, by the removal of water, by the aromatic oils of spices, by an excess of sugar or salt, by the presence of smoke, and by certain acids. While such chemicals as formaldehyde, salicylic acid, benzoate of soda, will preserve foods indefinitely by destroying or checking the growth of germs, their presence even in very small amounts is harmful to the body, hence their use as food preservatives should be forbidden by the Pure Food Laws.

Harmless Methods of Food Preservation

1. *Canning* — destruction of germs by heat and the subsequent exclusion of germs.
2. *Preserving* — destruction of germs by heat and the preventing of their growth by thick sugar syrup.
3. *Pickling* — prevention of growth of germs by acid and spices.
4. *Smoking* — prevention of growth of germs by smoke.
5. *Salting* — prevention of growth of germs by presence of salt.

6. *Cold Storage* — prevention of growth of germs by temperature of 37° F.

7. *Drying* — prevention of growth of germs by removing water.

Harmful Methods of Food Preservation

Use of formaldehyde, salicylic acid, borax, boric acid, benzoate of soda, "canning compounds," and alcohol.

Sterilization and Pasteurization. — Sterilization is the complete destruction of bacteria. When a thing is free from bacteria and other forms of life, it is sterile, no matter how the condition is brought about.

The purpose of pasteurization is to sterilize sufficiently to make a food safe without injuring its flavor or digestibility. Few bacteria can live in a temperature above 157° F. Some bacteria have the power of reproducing by the forming of spores which will resist such heat as may destroy the bacteria themselves. Dry heat destroys bacteria with certainty only at a temperature of 284° F.

Pasteurization is the raising of a substance to a temperature of from 155° F. to 170° F. and the maintaining of this temperature for twenty minutes, when the substance should be cooled rapidly; by this process most of the harmful germs are supposed to be destroyed.

Canning and Preserving. — The purpose of canning is to destroy by heat germs already present in the food and to exclude the entrance of other germs. The purpose of preserving is to destroy by heat germs already present and to protect the food by means of a thick sugar syrup.

The factors most essential in the processes of canning and preserving are (1) the complete sterilization of the food to be

preserved, (2) the complete sterilization of the cans or jars into which the food is to be placed, (3) the complete sealing of the jars to prevent the entrance of germs. Vegetables contain more spore-forming bacteria than do fruits, hence are more difficult to preserve.

Methods of Fruit Preserving:

1. — Prepare fruit, place in jars, fill the jars with syrup, put on the cover lightly. Set the jars in a steamer and cook till the fruit looks clear and is tender. Fill the jars to overflowing with the contents of one of the jars and seal securely.

2. — Make a syrup with desired amount of sugar and water, according to the fruit. Cook the fruit in the syrup until tender; put into sterilized jars, filling the jars to overflowing with the syrup. Seal securely.

Juicy fruits require little or no water. Strawberries are better when no water is added, or when they are cooked in a very heavy syrup. Large hard fruits, such as pears, quinces, etc., require longer cooking; before being placed in the thick syrup, they should be cooked in a thin syrup or steamed until nearly tender.

To Sterilize Jars:

Method 1. — Place the jars or glasses in a kettle of cold water, having a folded cloth or layers of paper in the bottom of the kettle to prevent the jars from coming in direct contact with the bottom of the kettle. Heat the water slowly to the boiling point. Remove the jars and fill immediately with fruit and syrup.

Method 2. — Set the jars in a steamer and steam about fifteen minutes. A large steamer may be improvised by placing a rack in the bottom of a wash boiler and setting the

jars on the rack. Do not wipe the inside of the jars with a towel as germs may be introduced into the jars by this means. Dip rubber rings into boiling water.

COST OF PRESERVED FRUITS, ETC.

Cost of Fruit used	Cost of Sugar used	Total Cost	No. Cans filled	Cost per Can	Market Price of Similar Can

Syrup for Canning and Preserving

One-third to 1 pound of sugar for every pound of fruit.

For small fruits add 1 to 1½ cups water for every pound of sugar.

For large fruits add 2 to 2½ cups water for every pound of sugar.

Boil the sugar and water together for 10 minutes before adding the fruit.

Canned Tomatoes

Cover tomatoes with boiling water, remove skins and hard stem end; slice and cook twenty minutes or until soft. Skim during the cooking. Fill sterilized glass jars to overflowing and seal securely.

Canned Tomatoes for Soup

Wash tomatoes, remove stem ends, but do not peel; slice and cook until soft. Rub through a wire strainer to remove seeds and skin. Boil the juice and pulp again. Fill sterilized jars and seal securely.

Preserved Peaches

The skins may be removed more easily from ripe peaches if boiling water is poured over them, allowing them to stand a few minutes and then placing them in cold water. Make a syrup as directed and either cook the peaches in it, a few at a time, or place peaches in jars and pour the syrup over them, finishing process according to directions given. The flavor of the peaches will be improved if a few of the peach stones are added to the syrup.

Pears, plums, etc., may be preserved in the same way. Peel the pears with a silver knife. Do not remove the skins from plums, but prick them with a large needle or fork to prevent skins from bursting.

Grape Juice (to be used as a beverage)

8 lb. perfect Concord grapes, — wash and stem. Add $1\frac{1}{2}$ qt. water and boil twenty minutes. Strain through a double cheesecloth. To every quart of juice add $\frac{1}{2}$ c. sugar. Boil ten minutes, skim; pour into sterilized jars or bottles, and seal securely.

Jelly. — Only those fruit juices which contain at least one-half per cent of acid and one per cent of pectin will form a jelly when cooked with sugar. Almost all fruits contain the requisite amount of pectin, but sweet fruits, such as peaches, pears, blackberries, contain too little acid; for this reason, acid must be added in order to make them jelly; an acid fruit, lemon juice, or tartaric acid may be used for this purpose. As before stated, the pectin is in the best condition for jelly making when the fruits are underripe or just ripe.

Fruits should not be overripe; the more perfect the fruit, the clearer will be the jelly. Berries, currants, and grapes require no water. Apples and quinces must be cooked in water before straining.

General Directions for Jelly Making. — Use a porcelain-lined or granite kettle. Drain the fruit juice through a jelly bag made of cotton flannel or double thickness of cheese-cloth. Do not squeeze the bag, but let the juice drip for several hours or over night. Measure equal quantities of juice and sugar. Boil the juice ten to twenty minutes; add the heated sugar and boil five minutes or until it forms a jelly. Pour into sterilized glasses; let stand twenty-four hours and cover with melted paraffine. Put tin covers on the glasses or cover them with wrapping paper to keep out the dust.

Crab Apple Jelly

Wash apples, cut in pieces, but do not pare nor remove the seeds. Cover with cold water. Boil until soft. Strain as directed, boil juice twenty minutes, add an equal volume of heated sugar, boil five minutes or until it jellies. Finish as in directions for jelly making.

Grape Jelly

Select grapes that are not fully ripe, wash, and remove from stems. Put into a kettle, mash well, and cook about thirty minutes. Strain. Add $\frac{3}{4}$ c. hot sugar to every c. juice, and proceed as in directions for jelly making.

Marmalade, Etc.

Plum Conserve

4 qt. plums
$1\frac{1}{2}$ lb. sugar
3 oranges and 1 lemon chopped
1 lb. raisins
$\frac{1}{2}$ lb. nuts coarsely chopped

Remove stones from the plums, add the other ingredients with the exception of the nuts. Cook until it becomes thick; add the nuts and cook a few minutes longer. Put in glasses and seal as directed.

Pear Ginger

8 lb. pears 4 lb. sugar
25 cent jar preserved ginger cut fine

Peel the pears and cut them fine; add a little water and cook until they soften; add the sugar and the ginger with the juice. Cook until thick like a marmalade. Put in glasses and seal as directed.

Grape Jam

Wash grapes, remove from stems; squeeze the pulp into a stewpan. Cook pulp and rub through a strainer to remove seeds. Add the grape skins to pulp and ¾ lb. sugar to every pound of fruit. Cook slowly until it thickens. Put in glasses and seal as directed.

Spiced Grapes

Wash grapes and remove seeds as above. To every 7 lb. grapes (pulp and skins) add 3 lb. sugar, 1 pt. vinegar, ground spices to taste. Boil until the skins are tender and the mixture thickens. Put in glasses, sealing as directed.

Peach Marmalade

Peel peaches and slice fine. Add 1 pt. sugar to every quart of peaches. Let stand three or four hours; cook quickly twenty-five minutes. Put in glasses and seal as directed.

Pickles

Sweet Pickles

7 lb. fruit 3 c. vinegar
3½ lb. brown sugar ¾ c. spice (whole cinnamon, cassia buds, cloves, and allspice)

Tie spices in a cheesecloth bag, boil with the sugar and vinegar ten minutes. Add the fruit and cook until fruit is tender. Put in jars, fill with the syrup, and seal.

Small Cucumber Pickles

Scrub 2 qt. small cucumbers. Put in a bowl with ½ c. salt; cover with boiling water, and let stand over night. Drain. Put in a kettle with ½ pt. small onions, ½ sweet green pepper with seeds removed, 1 c. sugar, and ¼ c. whole spices tied in a bag; cover with vinegar, let come to boiling point, but do not boil. Seal while hot.

Chili Sauce

1 doz. ripe tomatoes peeled and cut up
4 good-sized onions chopped fine
3 cucumbers chopped fine
2 green peppers chopped fine
¾ c. brown sugar
2 tb. salt
1 pt. cider vinegar
1 tb. mixed ground spices

Boil all together slowly for two hours. Put into jars and seal while hot.

CHAPTER VII

SOUPS

THERE are in general two types of soup, — those made with meat or fish stocks and those made with milk or cream; some soups, however, contain both kinds of liquid.

CREAM SOUPS

Cream soups are prepared like a thin white sauce, to which the vegetable, etc., is added after being mashed and strained. Soups are thickened both to improve the consistency and to keep the vegetable from separating from the liquid.

To bind or thicken soups. — Melt the required butter, add the flour, and cook until bubbling ceases. Let this mixture cool, add some of the hot soup to make it thin enough to pour, then stir this into the remainder of the hot soup and cook until it thickens and is smooth.

Cream Tomato Soup or Mock Bisque

Scald 1 qt. milk in double boiler. Bind with 4 tb. butter, 6 tb. flour. Cook 10 minutes. Add 2 ts. salt, $\frac{1}{8}$ ts. pepper. Cook 1 pt. tomatoes until soft. Strain. Reheat and add $\frac{1}{4}$ ts. soda. Add to thickened milk and serve immediately.

NOTE FOR STUDENTS. — Why is soda added to the tomato? Why do you not cook the white sauce and tomato together?

Cream of Celery Soup

3 c. chopped celery
1 slice onion

Cook together in 1 pt. water three quarters to one hour. Rub through a purée strainer. Add water, as it cooks away, to make one pint. Add 3 c. milk. Bind with 4 tb. butter, 5 tb. flour. Cook 10 minutes. Season with $1\frac{1}{2}$ ts. salt, $\frac{1}{8}$ ts. pepper.

Add $\frac{1}{3}$ ts. beef extract, or cook the celery in water in which chicken or veal has been cooked.

Cream of Potato Soup

3 small potatoes, boil and mash. Cook the potatoes until a little overdone and the soup will not be grainy. Scald 1 qt. milk with 2 slices of onion; add to the mashed potatoes and strain into the upper part double boiler. Bind with 3 tb. butter, 2 tb. flour. Cook 10 minutes. Add $1\frac{1}{2}$ ts. salt, $\frac{1}{4}$ ts. celery salt, $\frac{1}{8}$ ts. pepper, few grains cayenne, 1 ts. chopped parsley.

Note to Student. — Why is the amount of flour less than that used in other cream soups?

Clear Tomato Soup

1 qt. tomatoes	$\frac{1}{4}$ bay leaf
1 pt. stock or water	4 peppercorns
1 small onion	2 cloves

Sprig of parsley

Cook together ten minutes or till tomatoes are soft. Strain. Bind with

3 tb. butter	Add 2 ts. salt
3 tb. cornstarch	Cook ten minutes

Cream of Spinach Soup

Trim roots and wilted leaves from 2 qt. spinach. Wash spinach well and cook thirty minutes in 2 c. water with 2 slices onion. Rub through purée sieve. Add 3 c. milk. Bind with 4 tb. butter and 5 tb. flour. Season with 1 ts. salt and a speck of cayenne pepper.

Baked Bean Soup

2 c. baked beans	2 c. water
2 slices onion	2 c. tomatoes

Cook all ten minutes, press through a strainer. Bind with 2 tb. butter, 3 tb. flour. Season with salt, pepper, celery salt, and paprika.

All cream soups are improved if a little whipped cream is added just before they are served, being sure that soup is very hot.

SOUPS WITH STOCK

Stock is the liquid extract of meat and bone.

Proteins present in meat:

1. *Albumen.* — Soluble in fresh and slightly salted cold water. Coagulates with heat. Builds body tissues.

2. *Globulin.* — Soluble in slightly salted cold water. Coagulates with heat. Builds body tissues.

3. *Extractives.* — Give flavor to the meat. Soluble in hot and cold water. Do not coagulate with heat. Do not build body tissues.

4. *Collagen of connective tissues.* — Forms gelatin when boiled with water. Jellies when cold. Does not build body tissues, but is a "protein sparer."

Experiment 35. — *a.* Cut meat in small pieces and soak in cold, slightly salted water. What color does the water become?

What has been withdrawn from the meat into the water? What effect has cold water upon meat? How should meat be washed?

b. Remove meat from water and heat the water. Note temperature at which flakes form. Boil. What is the scum which forms? Why has it formed? What is the cooking temperature for soups? Should the scum which forms in the early stages of soup making be removed in making (*a*) a highly nutritious soup, (*b*) a clear soup? Are clear soups nutritious? Why?

Experiment 36. — Pour boiling water on meat. Let stand a few minutes. Cut meat. What effect did the boiling water have upon the surface of the meat? What is the color of the water? Does boiling water draw out the juices of meat?

Experiment 37. — Hold a piece of meat directly over a hot fire, as in broiling. Turn often. Place meat on a dish. Cut it. What effect did high temperature of fire have upon the meat? Compare the flavor and color of the meat with boiled meat. What effect does high-temperature cooking have upon the flavor of meat?

Meat is cooked in water:

a. In making soup; all of the nourishment of the meat should be drawn out into the water.

b. In stews; part of the nourishment should be left in the meat.

c. For serving meats whole; all of the nourishment should be retained in the meat.

For (*a*) the meat should be cut in small pieces, put on the stove in cold, slightly salted water, and simmered gently for five or six hours.

For (*b*) the meat should be cut in pieces suitable for serving, covered with boiling water, and then simmered gently for two or three hours, the salt being added when meat is about half cooked.

For (*c*) the meat should be left whole, be plunged into boiling water, allowed to boil five minutes to coagulate the

protein on the surface, then simmered gently until tender, the salt being added when it is about half cooked.

Soup Stock. — The cheapest and toughest cuts of meat may be used in making soups. The hind shin of beef or the rump bone, the knuckle of veal, the neck of mutton, may be used. Left-overs of meats and vegetables may be saved and added to the stock, and the trimmings of meat and bone sent from the butcher's may be used for the same purpose. The soup kettle should be of granite or, if of iron, it should be very smooth or porcelain-lined. The cover of the kettle should fit closely to retain the steam.

The scum which rises on the soup consists of the albumen and globulin of the meat and should not be removed. The long-continued action of hot water upon the collagen of the connective tissues will change it to gelatine and the fibers and bones will alone be removed upon straining. The stock should simmer gently for five or six hours, be strained through a colander, and allowed to cool, so that the fat may come to the surface and form a cake, which should be removed before the stock is used. In clear soups, every particle of fat must be removed.

A brown stock may be made by browning about one third of the meat and vegetables before adding them to the stock kettle.

About two thirds of the meat used should be lean, the other third, bone and fat.

Do not wash meat by putting it into water to soak, but wipe thoroughly with a damp cloth before cutting.

A general rule for stock: To every pound of meat and bone allow 1 qt. cold water, 1 ts. salt, 4 peppercorns, 4 cloves, $\frac{1}{4}$ ts. mixed herbs, 1 tb. each vegetable cut fine.

Stock

2 lb. shin of beef
2 qt. cold water
6 cloves
8 peppercorns
½ ssp. celery seed
½ ts. mixed herbs (whole)
2 ts. salt
4 allspice
1 sprig parsley
1 small onion
½ small carrot
½ small turnip

Wipe, and cut the meat into small pieces. Put into the cold water with the vegetables and seasoning, and soak ½ h. before heating; heat gradually and let simmer 5 or 6 h. Strain and cool quickly. When ready for use, remove all fat; heat, and season to taste.

Brown Soup Stock

4 lb. shin of beef
½ ts. peppercorns
½ bay leaf
4 ts. salt
4 qt. cold water
6 cloves
½ c. each, turnip, carrot, onion, and celery cut in dice
2 sprigs parsley

Wipe beef. Cut lean meat into inch cubes. Brown one third of meat in hot frying pan in the marrow from bone. Put remainder of meat and bone in soup kettle with water and let stand ½ h. Add browned meat, the vegetables, and seasoning, and heat gradually. Cook slowly 5 or 6 h., keeping just below the boiling point; strain and cool; remove fat.

Tomato Soup

1 pt. stewed and strained tomatoes
¼ ts. sugar
1 pt. stock
Salt and pepper to taste

Add tomatoes to boiling stock; season, and serve with croutons.

Vegetable Soup

1 qt. stock	$\frac{1}{8}$ c. onion
1 pt. boiling water	$\frac{1}{2}$ c. peas
$\frac{1}{2}$ carrot	$\frac{1}{2}$ c. celery
$\frac{1}{2}$ turnip	$\frac{1}{2}$ c. tomato
$\frac{1}{2}$ potato	1 tbsp. rice

Cut vegetables into uniform pieces or chop fine. Boil carrot and turnip, celery, onions, and rice in water 20 m.; add other vegetables and cook till tender. Add stock, and salt and pepper to taste. Boil 10 minutes and serve.

Bouillon

5 lb. lean beef	1–3 c. each carrot, turnip,
2 lb. bone	onion, celery
4 qt. cold water	$\frac{1}{2}$ ts. peppercorns
1 tb. salt	

Wipe, and cut meat into inch cubes. Put two thirds of meat in soup kettle with bone and water, and soak $\frac{1}{2}$ h. Brown remainder of meat in marrow from bone, put into the soup kettle, heat slowly and simmer 5 h. Add seasoning and vegetables. Cook 1 h., strain and cool. Remove every particle of fat and clear. Serve in cups with a slice of lemon.

To clear Soup

Allow the white and shell of 1 egg to every quart of stock, season with $\frac{1}{2}$ ssp. celery seed, salt to taste, and add the thinly shaved rind of $\frac{1}{2}$ lemon.

Crush the shell, beat the white slightly, and add all to cold stock. Stir constantly till boiling point is reached. Boil 2 m. Set back where it may simmer 20 m. Strain through double thickness of cheesecloth. Reheat and serve.

White Soup Stock

3 lb. knuckle veal	1 large stalk of celery
1 lb. lean beef	½ ts. peppercorns
3 qt. water	¼ bay leaf
1 onion	2 sprigs thyme
6 slices carrot	2 cloves

Wipe, and cut meat into small pieces. Break the bone in several places. Put into a soup kettle and cover with cold water. Simmer gently for 4 h. Add vegetables and seasoning and simmer 1 h. longer. Strain; when cool, remove fat.

Corn Soup

1 pt. grated corn or kornlet	4 tb. flour
1 qt. white stock or water	1 ts. chopped onion
1 pt. milk	Salt and pepper
3 tb. butter	Beaten yolks 1 or 2 eggs

Cook the corn and onion in stock or water 20 m. Rub through a sieve and add milk. When boiling, bind with the flour and butter. Add seasoning. Just before serving add the beaten yolks and serve immediately.

Cauliflower Soup

4 c. hot white stock	½ bay leaf
½ cauliflower	¼ c. flour
3 tb. butter	2 c. milk
1 slice onion	Salt
1 stalk celery	Pepper

Soak cauliflower, head down, 1 h. in cold water. Cook in boiling salted water 20 m. Reserve a quarter of the flowerets, and rub remaining cauliflower through sieve. Cook onion, celery, bay leaf, in butter 5 m., but do not brown. Remove bay leaf, add flour, and stir into hot stock; add cauliflower and milk. Season, strain, add flowerets, and reheat.

Force Meat Balls (to serve with stock soups)

Chop cold cooked meat fine; season highly with salt, pepper, sweet herb, onion, etc.; moisten with yolk of egg and a little stock or water. Mold into small balls, roll in flour, and brown in hot fat. Serve with soup; or make larger balls and serve with a tomato sauce as a meat dish.

Croutons

Cut stale bread in $\frac{1}{3}$ inch slices and remove the crusts. Butter the slices lightly and cut them into $\frac{1}{3}$ inch cubes; bake them till they are a delicate brown.

Toast Sticks or Rounds

Cut bread into sticks or rounds, spread these with butter, and sprinkle with grated cheese; bake until the cheese is melted. Serve very hot.

Crackers

Spread lightly with butter and cook in the oven until they are crisp.

NOTE. — Student write recipes for other cream soups, comparing them with those found in standard cook books.

CHAPTER VIII

PROTEIN—EGGS

Protein holds an important place among the food principles, for it is the only one which supplies the nitrogenous materials necessary for the building and repair of the tissues of the body. As the tissues of the body contain nitrogen, foods must be supplied which contain nitrogen in a form in which the body can use it. Protein forms the basis of all living cells, being an essential part of the protoplasm, a jellylike content of the cell. Sugars and starches contain no nitrogen and for this reason obviously cannot serve the important purpose which protein does. Without protein foods the body will weaken and undergo nitrogen starvation, or a breaking down of the tissues.

The protein molecules are very complex, containing probably many atoms each of the various elements of which they are composed. While something is known of the arrangement of these atoms, much is still to be learned and their chemical formulæ have not been determined. Besides their important functions as tissue builders, the proteins serve also as heat-giving foods, as they contain carbon and hydrogen. Some of the substances into which they are changed during digestion are capable of forming fat in the body. To depend chiefly on protein, however, for fuel and for body fat is undesirable for many reasons, one of which is that foods rich in protein are almost always high priced. Fortunately, carbohydrates and fats seem to act to some

extent as protein sparers, and when they are used in sufficient quantity, they prevent undue destruction of protein for the production of heat.

Identification Test for Protein. — Put raw white of egg in a saucer. Cut with a pair of scissors until you can take up a spoonful. Put $\frac{1}{2}$ ts. of it in a test tube with a little water, add a few drops of nitric acid (HNO_3). A white precipitate forms which when boiled turns yellow. This yellow color is characteristic of protein. When the mixture is cool, add a few drops of ammonia (NH_4OH). An orange-brown color will result.

EXPERIMENT 38. — Test various foods to detect the presence of protein. Tabulate results.

EXPERIMENT 39. — *Part* 1. Prepare raw white of egg by cutting with scissors, and add to a small part of it ten volumes of water; filter through filter paper. Test the filtrate for protein. Is protein soluble in cold water?

Part 2. Repeat, using boiling water with white of egg. Is albumen soluble in boiling water? In cooking meats in water, when should they be placed in cold water? in boiling water?

EXPERIMENT 40. — Remove the residue of egg white left in the filter paper of Part 1 of the previous experiment, and put it in a test tube. Add a weak salt solution; mix well; filter. Test filtrate for protein.

Is globulin soluble in weak salt solution? When should you add salt to water in cooking meats?

EXPERIMENT 41. — Effect of heat upon albumen and globulin.

Put half the white of an egg in a test tube. Put a thermometer in the tube and place it in a pan of cold water, having water deep enough to surround the egg; heat the water gradually. Note temperature when the first signs of coagulation are seen in the egg. At 180° F. remove some of the albumen; continue heating to 212° F. Compare the consistency of albumen cooked at 180° F. and 212° F. What is the correct temperature for "soft-cooked" eggs?

EXPERIMENT 42. — (*a*) Boil 1 pt. water, place two eggs in it,

remove from fire, keeping kettle closely covered to retain heat. At end of six minutes, remove one egg; remove the other at the end of ten minutes.

(*b*) Put an egg in boiling water and let boil three and one-half minutes.

Compare the consistency of the three eggs. Is there any difference? What is the best method for cooking eggs soft?

EXPERIMENT 43. — (*a*) Cook an egg in boiling water for seven or eight minutes.

(*b*) Cook an egg in water just below the boiling point for twenty minutes or longer.

Compare (*a*) and (*b*). Note difference in consistency of yolks and whites. What is the best method of cooking eggs hard? What effect does the temperature of 212° F. have upon protein?

Classification of Proteins. — All proteins contain nitrogen, carbon, hydrogen, oxygen, sulphur; some contain also phosphorus and iron. However, there are many forms of protein, all possessing widely varied chemical and physical properties. By such experiments as those that have been performed and others much more complicated and extended, scientists have learned enough about these substances to classify them as follows:

I. Simple Proteins:

A. Albumen, found in egg, blood, milk, etc.
Properties: (1) Coagulates with heat
(2) Soluble in water
(3) Soluble in weak salt solution
(4) Insoluble in strong salt solution

B. Globulin, found in egg, muscle, blood, milk, etc.
Properties: (1) Coagulates with heat
(2) Insoluble in water
(3) Soluble in weak salt solution
(4) Insoluble in strong salt solution

C. Alcohol-Soluble Proteins

(1) Glutenin and gliadin, found in wheat, which, when mixed with water, unite to form gluten

(2) Legumen of peas and beans

D. Albuminoids or proteins found in skeleton and framework. Principal form is collagen, which is found in the white fibers of connective tissue and which, when boiled with water, forms gelatin

Properties: (1) Dissolve in hot water

(2) Form a jelly when cold

E. Extractives

In the animal body proteins are constantly breaking down into simpler substances, some of which contain nitrogen. At the time of killing, some of these nitrogenous substances are in the tissues; they can be extracted with water and for this reason the name "Extractives" has been given them. As a human food they serve as mild stimulants and also as flavoring materials. It is not thought, however, that they can be used as building stones. If an animal is fed on a diet in which extractives are the only nitrogenous substances, it dies of what is called nitrogen starvation.

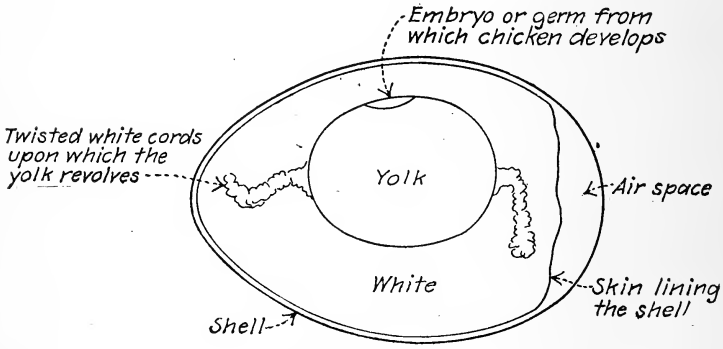
The extractives are not coagulated by heat; they will, therefore, remain in solution when meat juice is heated. Not so, however, the albumen and globulin of meat juices; they are coagulated at a certain temperature and rise to the surface and form a scum. A beef broth, therefore, in which the proteins have been coagulated and removed by skimming or straining is wholly lacking in tissue-forming substances; it is mildly stimulating, however, *i.e.* it spurs on the various processes of the body and may be the means of supplying water in a very acceptable form.

II. Conjugated Proteins. — Proteins which contain some other molecule united to the protein molecule

A. Phospho-proteins. — Are compounds of protein with a phosphorus-containing substance. They are especially adapted to furnish the material for tissue growth. They are present in the casein of milk and vitellin of egg yolk.

B. For other forms of protein see "Chemistry of Food and Nutrition," *H. C. Sherman.*

EGGS



Section of a Hen's Egg

Composition of Edible Portion of Eggs — (*H. C. Sherman*)

Water, 73.7%; Fat, 10.5%; Protein, 14.8%; Ash, 1.0%.

Composition of Yolk of Egg

Water, 50.9%; Fat, 31.75%; Protein, 16.2%; Ash, 1.09%.

Composition of White of Egg — (*Hutchinson*)

Water, 85.7%; Fat, 0.25%; Protein, 12.6%; Ash, 0.59%.

Eggs contain all the elements necessary for the growth of the body, as from the egg the young chick is formed. They are lacking, however, in carbohydrates, so it is better to eat them with bread, rice, potato, or other starchy foods. The

yolk of the egg forms a valuable source of iron and phosphorus for the body.

The edible portion of newly laid eggs almost fills the shell, but as the shells are porous the water evaporates, and air, containing decomposing bacteria, takes its place. As it is the presence of these bacteria which causes the egg to spoil, the principle of egg preservation is to prevent the evaporation of water by filling the pores of the shell. This is accomplished by placing the eggs in a solution of water glass. A fresh egg, containing more water than a stale one, will sink in water.

To preserve eggs in water glass (*sodium silicate*). — Boil ten to twelve quarts of water, rain water if possible. When cold, add one quart of water glass. Place clean, strictly fresh eggs in crocks, small ends down, and cover them with the water glass mixture. As the eggs will keep fresh for months, they may be preserved when the price is lowest.

Price of eggs :	January	. . . .	September
. . . .	April	. . . .	November

When eggs are beaten, the tenacity of the albumen causes them to entangle air, thus increasing their bulk many times. In a cake or other mixture subjected to the heat of the oven, the air expands and lightens the mixture. If the egg is to be used to make mixtures light, we beat the egg well. For other purposes, to enrich or thicken mixtures, for example, there is no object in beating it more than enough to break it up and to insure its even distribution.

The loss of weight when eggs are boiled is due to elimination of water. The coagulation is a rearrangement of the atoms of the molecule, but there is no change in composition.

When eggs are brought into the house, they should be washed and then put into a cool, dark place. They will keep better if perfectly clean, and it is a convenience to have the shells ready for use in clearing coffee.

Soft-cooked Eggs

Put eggs into boiling water to well cover them. Remove kettle from stove and place where it will keep warm. Leave the eggs in the water from six to eight minutes.

Hard-cooked Eggs

Cook eggs in water just below the boiling point for twenty minutes. The yolks will then be dry and mealy and will be easily digested.

Creamed Eggs

Cut four hard-cooked eggs in halves or quarters and pour over them one cup white sauce.

Egg Toast

Add the chopped whites of 3 hard-cooked eggs to 1 c. thin white sauce and pour over three slices of toast. Rub the yolks through a strainer over the whole. Reheat in the oven, if necessary. Garnish with parsley and serve.

Poached Eggs

Have a shallow pan nearly full of boiling salted water. Reduce heat until the water is motionless. Break the eggs into a saucer, one by one, and slip into the hot water. When a film has formed over the yolks and the white is firm, take up with a skimmer and place on pieces of toast of uniform shape and size.

Baked Custard

2 c. milk
2 or 3 eggs
$\frac{1}{4}$ c. sugar
Pinch of salt
Nutmeg

Beat eggs slightly, and add to them the sugar and salt. Pour on them the milk. Strain into a buttered mold, add nutmeg.

Set mold in a pan of hot water. Bake in a slow oven till firm and until a knife inserted will come out clean. Do not allow the water around the custard to boil, as egg and milk combinations must cook at a low temperature or they will separate and become watery. Allow 2 eggs for cup custards and 3 if baked in a large mold.

General Rules for Omelets.—The pan for an omelet should be very clean and smooth. Allow one tablespoonful of water or milk to each egg used. For creamy omelets, beat the eggs slightly; for beaten omelets, beat the yolks and whites separately until very light. Chopped meat, chicken, vegetables, cheese, etc., may be spread over an omelet just before folding.

Creamy Omelet

4 eggs
4 tb. milk or water
½ ts. salt
½ ssp. pepper

Beat eggs slightly, add other ingredients, mix well, and pour into a hot, buttered omelet pan. Lift gently with a fork as it begins to cook, letting the uncooked egg run under. When of a creamy consistency, roll and turn out.

Ham Omelet

Make the same as creamy omelet, and as soon as it begins to thicken, spread with 3 tb. finely minced ham. Roll and serve.

Veal and chicken may be used the same way.

Beaten Omelet

Beat yolks of two eggs till lemon-colored and thick, add 2 tb. milk, 1 ssp. salt, ½ ssp. pepper, fold in the beaten whites. Pour immediately into hot, buttered omelet pan, let brown on one side slightly, set in the oven to dry on top a little, fold, and turn on to hot platter.

Potato Omelet

Chop 2 boiled potatoes fine, brown in 1 tb. hot butter, sprinkle with salt, pepper, and chopped parsley. Keep warm while you make a creamy omelet. When the omelet is partly set, spread potatoes over it, roll, and serve.

Spanish Omelet

3 tb. chopped bacon
1 tb. chopped onions
2 tb. chopped green pepper
5 button mushrooms, chopped
1 c. tomatoes

Fry bacon, add onion and pepper, and cook till light brown. Add tomatoes and cook till of consistency of white sauce. Add mushrooms and salt to taste.

Make a creamy omelet and just before folding spread with this mixture, or pour around a beaten omelet after it is on the platter.

CHAPTER IX

COMPOSITION AND PREPARATION OF MEATS

AVERAGE COMPOSITION OF MEATS

Farmers' Bulletin No. 142, U. S. Dept. of Agriculture

	Refuse	Water	Protein	Fat	Carbohydrates	Ash
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Beef:						
Porterhouse steak	12.7	52.4	19.1	17.9	——	0.8
Sirloin steak	12.8	54.0	16.5	16.1	——	0.9
Ribs	20.8	43.8	13.9	21.2	——	0.7
Round	7.2	60.7	19.0	12.8	——	1.0
Rump	20.7	45.0	13.8	20.2	——	0.7
Flank	10.2	54.0	17.0	19.0	——	0.7
Veal:						
Leg	14.2	60.1	15.5	7.9	——	0.9
Breast	21.3	52.0	15.4	11.0		0.8
Leg cutlets	3.4	68.3	20.1	7.5	——	1.0
Mutton:						
Leg, hind	18.4	51.2	15.1	14.7	——	0.8
Loin chops	16.0	42.0	13.5	28.3		0.7
Flank	9.9	39.0	13.8	36.9		0.6
Lamb:						
Breast	19.1	45.5	15.4	19.1		0.8
Leg, hind	17.4	52.9	15.9	13.6		0.9
Pork:						
Ham (fresh)	10.7	48.0	13.5	25.9		0.8
Loin chops	19.7	41.8	13.4	24.2		0.8
Shoulder	12.4	44.9	12.0	29.8		0.7
Ham (smoked)	13.6	34.8	14.2	33.4		4.2
Salt pork	——	7.9	1.9	86.2		3.9
Bacon	7.7	17.4	9.1	62.2		4.1

Structure of Meat. — EXPERIMENT 44. — Pick apart with needles some of the fibers of uncooked meat. Examine fibers under a microscope. Make drawings, noting the stripes (striæ) on fibers. Describe fibers of meat.

The fibers or tubes are held together in bundles by means of connective tissues; these connective tissues consist of collagen, which is converted into gelatine by boiling in water. Thus, in cooking, the connective tissues are changed and the meat becomes more tender. The harder and tougher the connective tissues of the meat, the longer the time which will be required in cooking to change them to gelatine. In tender meats the collagen is changed by the steam formed from the juices of the meat in the processes of boiling and baking, but a large amount of water must be added to very tough meats to bring about this conversion. Hence tough meats must be cooked for a long time in a liberal amount of water and the temperature be kept just below the boiling point, in order that the protein may not be toughened.

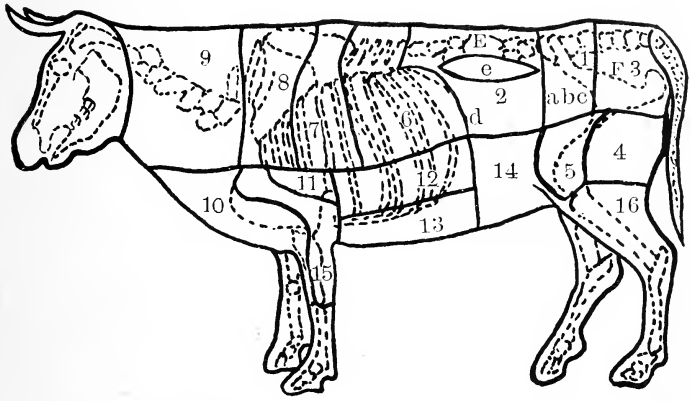
Tender Meat. — Muscles which are least used by the animal are the most tender, as those of the tenderloin, loin, and ribs. These command the highest market prices. The tube walls of the muscles are thin and delicate and there is little connective tissue. The tougher cuts of meat are equally nutritious and are much cheaper, and may be made into very palatable dishes.

Beef. — The best beef is obtained from steers, four to six years old, which are raised in the West and shipped alive to Chicago or some other packing center. After slaughtering, the animal is dressed and divided into quarters, which are placed at once in cold storage in order that they may cool quickly, for this improves their quality. From the cold storage rooms the beef is shipped in refrigerator cars to

different parts of the country. Beef should hang from two to four weeks that it may become tender, but is often kept a much longer time without deterioration.

BEEF

Diagram Showing Bones and the Various Market Cuts (Williams and Fisher)



Names of Cuts	Food Uses
1. Sirloin.	Steaks. (a) Hip bone sirloin, best sirloin steak. (b) Flat bone sirloin, second best sirloin. (c) Round bone sirloin, poorest sirloin.
2. Porterhouse.	Steaks. (d) Club steak. (e) Tenderloin.
3. Rump.	Corning. (f) Best corning piece.
4. Round.	Steaks and made dishes.
5. Top sirloin.	Pot roast and steaks.
6. First prime ribs.	Best roasts.
7. Second cut ribs.	Roasts.
8. Chuck ribs.	Poorer roasts and steaks.
9. Neck.	Beef tea, stews, or boiling.
10. Brisket.	Corning.
11. Cross rib.	Pot roast.
12. Plate.	Corning.
13. Navel.	Corning.
14. Flank.	Stews or boiling.
15. Shoulder.	Soup.
16. Shin.	Soup.

Points to Note in Judging Beef

1. It should be a bright red color after it has been cut a short time.
2. It should be well marbled with yellowish fat.
3. It should have a thick layer of fat overlying the muscles.
4. It should be firm to the touch.
5. It should be free from disagreeable odor.

MARKET CUTS OF BEEF

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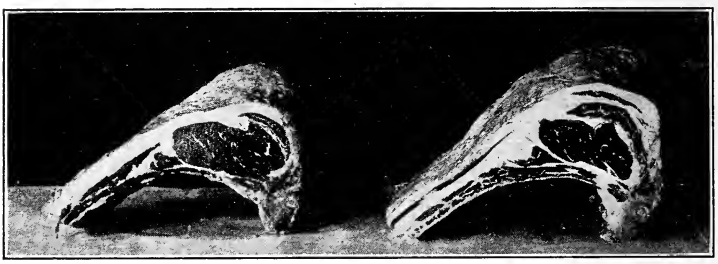
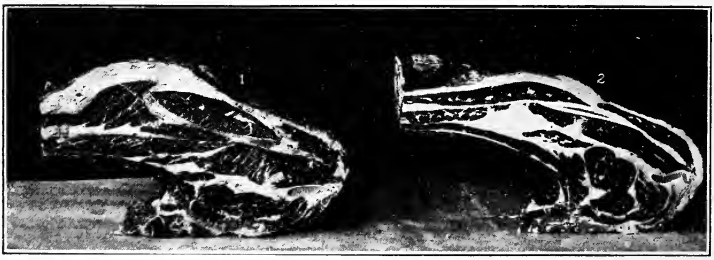


First cut Prime Ribs

Second cut Prime Ribs

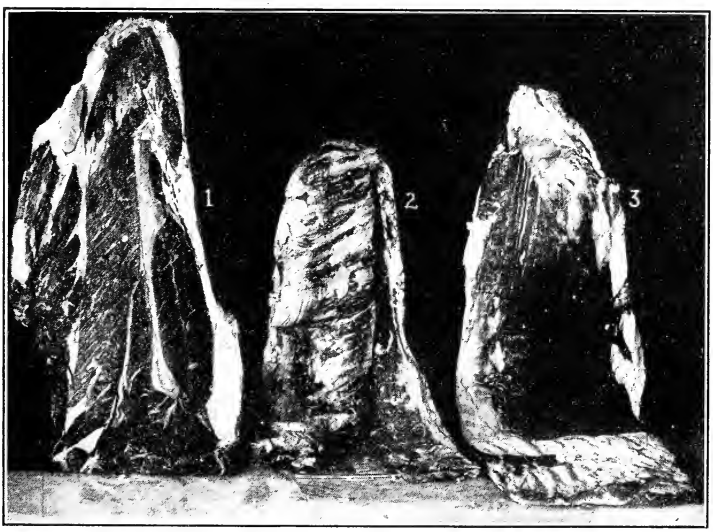


Chuck Ribs

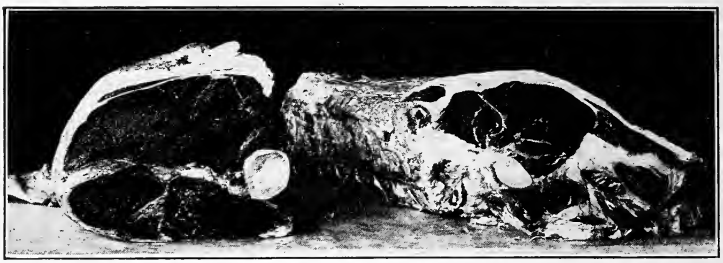
Blade Ribs

Porterhouse Steak — Small Porterhouse and Club Steak

Flat-bone Sirloin — Hip Sirloin



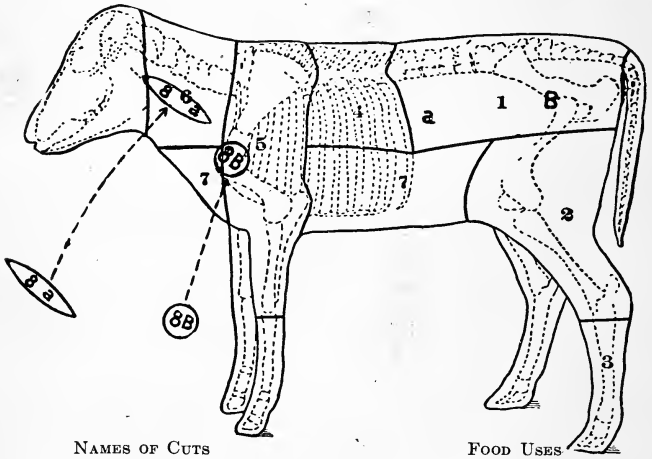
1. Chuck Steak — **2.** Skirt Steak — **3.** Flank Steak



Round Round bone Sirloin

VEAL

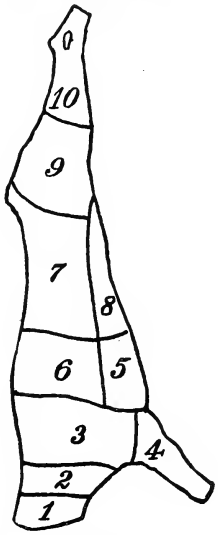
Diagram Showing Bones and the Various Market Cuts (Williams and Fisher)



Names of Cuts	Food Uses
1. Loin.	Roast and Chops.
	(a) Best Chops.
	(b) Poorer Chops.
2. Leg.	Roast and Steaks.
3. Knuckle.	Soup.
4. Ribs.	Chops.
5. Shoulder.	Stuffed and Roasted.
6. Neck.	Stew.
7. Breast.	Roast, Stew.
8. Sweetbreads.	
(a) Thymus gland in throat.	
(b) Pancreas.	

Veal. — Veal is the meat obtained from the calf. The flesh should be pink, and the fat white. If the flesh is white, the animal has been bled before being killed, or is too young to be fit for food. Veal may be obtained throughout the year, but is in season in the spring.

SIDE OF VEAL



1. Neck. 2. Chuck. 3. Shoulder. 4. Fore Shank. 5. Breast. 6. Ribs. 7. Loin. 8. Flank. 9. Leg. 10. Hind Shank.

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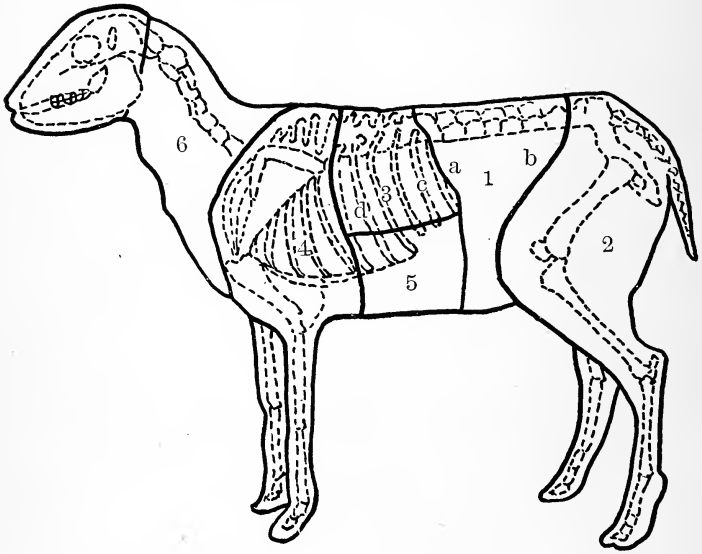
Veal should be thoroughly cooked and highly seasoned. Being deficient in fat, pork or butter should be used in the cooking. Veal is divided into fore and hind quarters. The fore quarter is divided into the breast, shoulder, ribs, and neck; the hind quarter into the loin, leg, and knuckle. Cutlets and fillets are taken from the thick part of the leg, corresponding to the round of beef.

Mutton and Lamb. — Mutton is the name applied to the meat of sheep. The best mutton comes from a heavy animal about three years old. The flesh should be of a bright red,

MUTTON AND LAMB

Diagram Showing Bones and Various Market Cuts (Williams and Fisher)

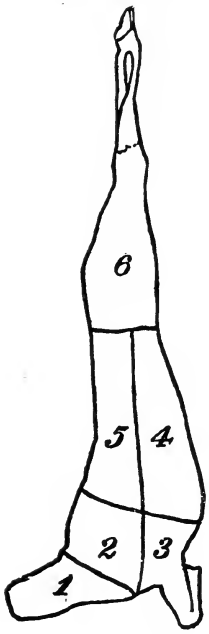


Names of Cuts	Food Uses
1. Loin.	Chops. (a) Best chops. (b) Poorer chops.
2. Leg.	Roast or boiled whole and steaks.
3. Ribs.	Chops. (c) Best chops. (d) Poorer chops.
4. Shoulder.	Stuffed and roasted.
5. Breast.	Stew.

and the fat hard and white. The meat should hang from two to three weeks to be in the best condition. The strong flavor of mutton may be lessened by removing the pink skin and trimming off the superfluous fat. Mutton ranks with beef in nutritive qualities.

Lamb is the name applied to the meat of lambs. When killed from six weeks to three months old, it is known as spring lamb, and may be procured as early as February, but

SIDE OF MUTTON



1. Neck.
2. Chuck.
3. Shoulder.
4. Breast.
5. Loin and Ribs.
6. Leg.

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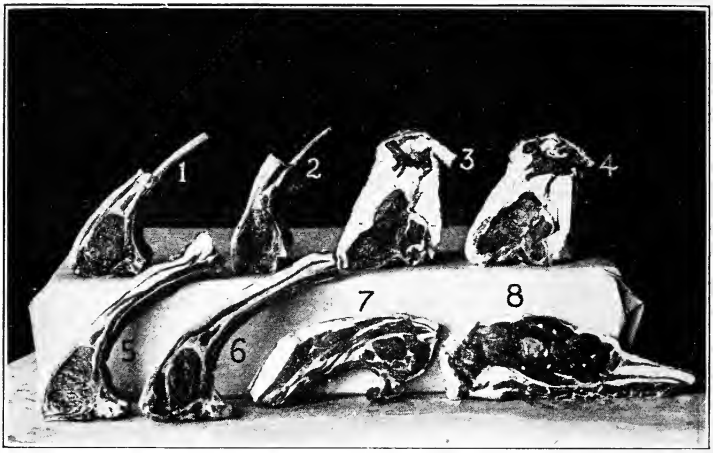
is scarce till March. Lamb may be eaten soon after the animal is killed and dressed. The bones of lamb are pink, while those of mutton are white. Lamb is preferred well done; mutton is often eaten rare.

Lamb and mutton are divided into two parts by cutting through the backbone, then subdivided into the hind and fore quarter. The ribs and loins are used for chops and roasts. The leg is sold whole for boiling or roasting. The breast is generally used for stews and the neck for broth.

Market Cuts of Lamb and Mutton



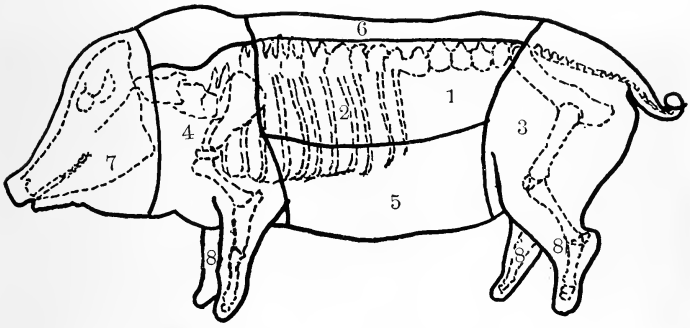
1 and 2. Rib chops, Frenched.
3 and 4. Loin chops.
5 and 6. Rib chops.
7. Blade shoulder chop.
8. Round-bone shoulder chop.

Pork. — Pork is the meat of the hog. It contains more fat than that of any other animal. The lean should be fine-grained and of a pale red color, the fat white, and the skin clear and smooth. Reject the meat if the fat is a yellowish white and full of small kernels, and the flesh soft. The hind legs are salted and smoked and are called ham. Sugar-cured hams are the best. The shoulders are also salted and smoked and sold cheaper as "picnic hams." The ribs and loin are used for chops and roasts. The flank, which lies

just below the ribs, is salted and smoked and called bacon. The best salt pork comes from the back on either side of the backbone. The solid fat which lies inside the flank is known as leaf lard.

PORK

Diagram Showing Bones and Various Market Cuts (Williams and Fisher)



Names of Cuts	Food Uses
1. Loin.	Chops or roast.
2. Ribs.	Chops or roast.
3. Ham.	Boiled or sliced and broiled, etc.
4. Shoulder or picnic ham.	Poorer cut of ham.
5. Breast.	Salt pork or bacon.
6. Clear back fat.	Salt pork.
7. Jowl.	Head cheese, etc.
8. Pigs feet.	Pickled.

The tenderloins, of which there are two, lie under the backbone and extend from the ribs under the loin. Pork should be thoroughly cooked to be wholesome. It should not be eaten except in cold weather and never by children or people of weak digestion.

Note. — Students obtain prices of the various cuts of meat and tabulate them to show,

(1) Prices procured by self, from "family" butcher.

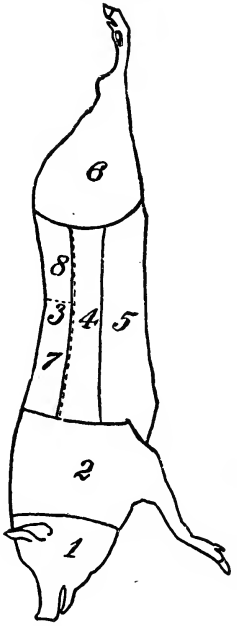
(2) Highest prices procured by any member of class.

(3) Lowest prices procured by any member of class.

Each class should visit a local meat market to inspect meat.

General Methods of Cooking Meats: 1. Application of intense heat to keep in the juices and develop flavor. This is suitable for tender meats only. Broiling, roasting.

Side of Pork



1. Head.
2. Shoulder or Picnic ham.
3. Back fat.
4. Middle cut.
5. Breast.
6. Ham.
7. Ribs.
8. Loin.

2. Cooking in water at low temperature. This is suitable for tough meats, bone, gristle, etc. Soups, stews.

3. Browning or searing the meat with high temperature to develop flavor, and then cooking slowly in water to soften the fibers. This is suitable for meats that are neither tender nor very tough. Pot roasts, braising, casserole, etc.

Stewing. — Stewing is a form of boiling or cooking for a long time, in a small amount of water, at a low temperature. The long-continued action of gentle heat will soften the coarsest fibers and connective tissue of meats, and thus the cheapest cuts of meat may be made palatable.

Remnants of meat may be seasoned in various ways, and thus be made savory and attractive.

Stews are called by various names, according to the nature of the ingredients, such as ragout, haricot, salmi, chowder, etc.

Braising is a form of stewing in a covered pan in an oven.

Beef Stew

2 lb. beef	4 small potatoes
1 onion	2 ts. salt
½ c. carrot and turnip diced	1 ssp. pepper
	Hot water to cover

Wipe the meat, remove from bone, and cut in 2-inch pieces. Sprinkle with salt and pepper, and dredge with flour. Melt some of the fat in a frying pan, add meat and the onion sliced, stir constantly that the surface may be quickly seared. Put into a kettle; rinse the frying pan with hot water that none of the goodness may be lost. Add remaining bone and fat, cover with boiling water and boil 5 m., then simmer until the meat is tender, about 3 hours. Add carrot and turnip the last hour. Parboil potatoes and add to stew 20 m. before it is done. Remove large bones and fat, and thicken the stew with 2 tb. flour wet in cold water. Dumplings may be added 10 m. before the stew is finished. Serve on a warm platter.

Dumplings

1 pt. flour	4 ts. baking powder
½ ts. salt	About 1 scant c. milk

Sift the dry ingredients, stir in the milk slowly, mixing with a knife till a soft dough is formed. Dip a spoon into the boiling stew,

then take up a spoonful of dumpling and drop into the stew, letting it rest on the meat and potatoes. Cover closely and steam 10 m. without uncovering. Do not let the stew stop boiling after the dumplings are added. Serve immediately.

Veal Stew

The breast, neck, and knuckle of veal may be used for stew. Cut 2 lb. of veal in small pieces, remove all fine bone. Cover meat with boiling water, skim as it begins to boil. Add 2 small onions, 2 ts. salt, 1 ssp. pepper. Simmer till tender, about 3 hours. Cut 4 small potatoes in halves, parboil them 5 m., add to the stew. Thicken with 2 tb. flour wet in cold water, add 1 c. cream or milk, and more seasoning if necessary.

Dumplings may be added.

Irish Stew

3 lb. neck of mutton
4 onions
4 potatoes, cut in dice
3 pt. hot water
Salt and pepper

Cut meat into pieces about 1 in. square, cover with the boiling water, add sliced onions, 2 ts. salt, and simmer gently 3 h. About 15 m. before the stew is done add potatoes. Season, and serve when potatoes are tender. Dumplings may be added.

Braising, Pot Roasts, etc. — Braising is a form of stewing in the oven. Pot roasting is cooking in a kettle on top of the stove, using only a small amount of water. The less tender cuts of meat may be cooked by either method. The meat is browned first to improve the flavor and is then cooked slowly in a small amount of water, in a closely covered kettle or pan, until tender.

Braised Beef

Sprinkle $\frac{1}{2}$ c. each salt pork, carrot, onion, and celery, cut in dice, in a covered dripping pan, and place 5 lb. beef round, rump, or

shoulder, on them. Add 1 pt. stock or water, ½ bay leaf, piece of red pepper or 6 peppercorns, 3 cloves. Dredge meat with flour. Let brown in hot oven. Spread a few more of the vegetable cubes on top, add 2 ts. salt. Cover closely and cook in oven very slowly 4 or 5 hours. Put meat on a platter, thicken the gravy, and serve with the meat. 1 cup tomato may be added when meat is half done.

Pot Roast

Four to six lb. from the rump, round, or shoulder of beef. Brown the cut sides in a hot kettle in some fat from the beef, add 1 c. hot water, season with salt and pepper, and place on the stove, where it will keep just below the boiling point. Do not let the water cook entirely away, but add only enough to keep the meat from burning. Cover closely and cook till very tender, but do not let it break. Serve hot or cold. When cold it may be cut in quarter inch slices and sautéed in hot butter.

Roasting. — Roasting is the process of cooking by the radiant heat of an open fire. It is seldom used now as a method of cookery, as few kitchens are supplied with the necessary apparatus. Roasting has been superseded by baking in an oven, although we still retain the name. Tender meats are most suitable for roasting. The larger the piece of meat, the less the surface in proportion to the weight; consequently, evaporation goes on less rapidly in a large piece, and it is more likely to remain juicy than a small one.

The meat should be placed in the oven without adding any water. As it begins to brown, baste it with the hot fat that has melted out of the roast into the pan. Add enough boiling water from time to time to just cover the bottom of the pan to assist in basting and to prevent burning. The salt and pepper should be added when the surface is well seared over by heat.

TIME-TABLE FOR ROASTING

Beef	Allow 15 minutes to each lb.
Mutton	Allow 20 minutes to each lb.
Veal	Allow 30 minutes to each lb.
Pork	Allow 30 minutes to each lb.
4 lb. chicken	Requires about 2 hours.
$2\frac{1}{2}$ to 3 lb. fish	Requires about 1 hour.

Roast Beef

Wipe meat with wet cloth, place in a dripping pan just large enough to hold it easily. Roast as in directions given.

Roast Beef Gravy (Brown Sauce)

Pour off all the fat from the dripping pan in which beef has been roasted, with the exception of about 4 tb. Add 5 tb. flour and stir till brown. Add 2 c. hot water. Cook five minutes or till thick and smooth. Season with salt and pepper.

Yorkshire Pudding

1 c. milk	1 or 2 eggs
1 c. flour	$\frac{1}{4}$ ts. salt

Mix salt and flour. Add milk gradually to form a smooth paste. Then add eggs beaten very light. Cover bottom of a dripping pan with some of the beef fat from the roast. Pour in the mixture one half inch deep. When well risen, baste with the fat from the roast. Bake 30 minutes. Cut in squares for serving. It may be baked in hissing-hot gem pans.

Roast Veal

The leg, the thickest part of the leg or round, the loin, and ribs are used for roasting. When the leg is used, have it boned at the market. Wipe meat, sprinkle with salt and pepper, stuff, and tie into shape. Place in dripping pan, dredge with flour and place strips of salt pork around it. Bake 30 minutes to the pound, basting every 15 minutes with the fat in the pan, and boiling water. Serve with brown gravy made as for roast beef.

Roast Mutton

Trim off pink skin and superfluous fat. Wipe the meat, sprinkle with salt and pepper, dredge with flour. Put in a hot oven and baste often, using a little hot water. Roast 20 minutes to the pound. Make a gravy in the pan, as for roast beef.

Broiling. — Broiling is derived from the French word "brûler," meaning to burn. It is cooking directly over a fire, and is the hottest form of cooking. Only the most tender portions of meat and fish are suitable for broiling. The intense heat sears or coagulates the albumen on the outside of the meat and forms a coating which retains the juices of the meat. The secret of success in broiling is frequent turning, for by this means the meat is prevented from losing its juices, and also from burning. The free action of the air around the article cooking, combined with the intense heat, gives a flavor that cannot otherwise be obtained.

If the fire is not suitable for broiling, the next best process is pan broiling or cooking in a hissing hot frying pan, without fat. Lay the meat on the hot pan, sear quickly on one side, turn (without sticking a knife or fork into it, thereby causing the juices to escape) and brown the other side. Turn often during the cooking. This is not frying if properly done, the frying pan, as commonly used, being the abomination of the American kitchen.

Time-Table for Broiling

Steak, one inch thick	4 to 6 m.
Steak, one and one half inch thick	6 to 10 m.
Small, thin fish	5 to 8 m.
Thick fish	12 to 15 m.
Chicken	20 m.

The best cuts for broiling are porterhouse, sirloin, cross cut of rump steak, and second and third cuts from top of round, of tender meat. The flank end of porterhouse may be removed before broiling and used in the soup kettle to prevent waste in broiling.

Broiled Steak

Wipe the meat carefully with a cloth wet in cold water and trim off superfluous fat. Rub the wires of the broiler with the fat and lay the steak in the broiler, having the thickest part in the center and the fat near the handle. Broil over a clear fire, having the chimney damper open, turning every ten seconds for the first minute, or until it is well seared. Hold the broiler farther from the fire and turn occasionally until it is cooked. Place on a warm platter, sprinkle with salt and pepper and bits of butter; set in the oven a moment to melt the butter. Or, omit seasoning and butter, and spread with lemon butter, or pour a brown mushroom sauce around it.

To broil with gas. — Heat the broiling oven. Lay the meat on the rack and put near the flame at first. Brown both sides, then lower the gas flame, or put the pan farther away from the flame, thus cooking more slowly until meat is done. Turn three or four times during the cooking. Put on a warm platter and season as above.

To pan broil. — Heat a heavy iron pan until a drop of water will rebound in balls from it. Lay the steak or chops directly on the pan without fat. Turn often. Reduce heat and continue cooking until done. Place on a warm platter. A little hot water, butter, salt, and pepper may be added to the pan and then be poured over the meat, for a gravy; or season as a broiled steak.

To cook chops. — Lamb and mutton chops may be broiled in the same manner as beefsteak. Veal chops must be more thoroughly cooked than is possible in broiling, so they must

be rolled in some form of fat-proof coating and cooked in hot fat. Pork chops also require long cooking, but they contain enough fat in themselves to finish the cooking if they are placed directly on hot pan.

Pork Chops

Wipe chops, sprinkle with salt and pepper, and place in a hot frying pan; reduce heat, cover, cook slowly until tender and well-browned on both sides, about twenty minutes.

Veal Chops

Trim and wipe the chops or slices from the thick part of the leg. Season with salt and pepper, roll in bread crumbs, then in egg beaten with 1 tb. water, and again in crumbs. Sauter in hot salt pork fat or lard till well browned on both sides. Arrange in a circle about the dish, and fill the center with mashed potatoes, peas, tomato sauce, or boiled and seasoned string beans. The chops may also be rolled in flour and cooked as above.

Ham

Wipe ham, remove the rind. Place ham in a hot frying pan and cook ten minutes or till brown on both sides. Put on a platter and keep warm. Make a gravy by adding 2 tb. flour to the fat in the pan and gradually stirring in 1 c. milk. Or fry eggs in the fat left in the pan and serve with the ham.

If cooked too long, ham will become hard and dry.

Bacon

Remove rind from thin slices of bacon. Put bacon in a fine wire broiler, place over a dripping pan and bake in a hot oven until bacon is crisp and brown, turning once. The fat which has dripped into the pan may be used for frying.

Lemon Butter

2 tb. butter
½ ts. salt
½ tb. lemon juice
½ tb. minced parsley
½ ssp. pepper

Mix well and spread on hot broiled steak, chops, or fish, after placing them on the platter.

Brown Mushroom Sauce

4 tb. butter
5 tb. flour
1 pt. hot stock
Salt and pepper
½ can mushrooms

Brown the butter, add flour and brown, but be careful not to burn. Let cool a little and add the stock gradually. Cook till smooth. Season, add mushrooms, and cook five minutes.

1 tb. Worcestershire sauce or catsup may be added.

Baked Breaded Veal and Tomato Sauce

One cup bread crumbs, 3 tb. chopped salt pork, salt, and pepper. Wipe veal chops or steak and spread with the dressing, after putting in the pan. Bake 30 m. and serve with a sauce. Lamb chops may be prepared in the same way. If the crumbs are too brown before sufficiently baked, baste with a little hot water. Put tomato sauce in the center of the platter and arrange the chops around the edge.

Hamburg Steak

Chop the round of beef fine and season with salt and pepper, and if desired, a little onion. Make into cakes. Put in a greased broiler and broil over clear coals. Spread with butter.

Veal Loaf

2 lb. lean veal chopped with ⅓ lb. salt pork. Add 4 butter crackers, rolled, 2 beaten eggs, 2 ts. salt, 1 ssp. pepper, 1 ssp. nutmeg. Pack into a small bread pan and bake slowly 2 hr. It may be served hot with a tomato sauce, or be served cold.

Dried Beef and Cream

¼ lb. dried beef, thinly sliced	1 c. milk
2 tb. butter	2 tb. flour

Remove the skin and separate meat in pieces. Cover with hot water and let stand 10 m. Drain and fry in the hot butter. Add the milk and when boiling stir in the flour wet in a little cold milk or water. Cook till smooth.

Warmed-over Meats. — To prepare meats for warming over, remove all bone, skin, gristle, and excess of fat from meat. The bone, skin, and gristle may be put in the soup kettle in making stock, and the fat may be tried out for drippings. Cook quickly all tender meat, for if kept at boiling point for any length of time, the protein will become tough. Make the tough portions of meat tender by letting them simmer in water. Rice, macaroni, bread crumbs, tomatoes, onions, etc., may be used in combination with different meats, making many palatable dishes. Meat pies may be made, using baking powder biscuit dough or pastry for an upper crust.

Hash

Chop cooked meat, using a small amount of fat. Add an equal amount of chopped cold boiled potatoes. Season with salt and pepper and a little chopped onion. Put 2 or 3 tb. hot water in an iron frying pan and 1 tb. drippings. Put in the mixture, cover the pan and let simmer slowly till a brown crust is formed; about 20 minutes. Do not stir. Fold over, turn out on a warm platter, and garnish with parsley.

Cottage Pie

Chop cold meat fine. To every cupful add 1 ssp. salt, ½ ssp. pepper, a pinch of summer savory or thyme, ¾ c. gravy or stock. Put into a baking dish and cover with a crust of mashed potatoes.

Brush with milk and bake in the oven till a golden brown, about twenty minutes. Omit the herb and add 1 ts. finely chopped onion, if liked.

Meat Réchauffé

Make a wall of mashed potatoes around a baking dish and fill the center with cooked meat cut in cubes. Pour over the meat a gravy, tomato, or white sauce. Bake till a delicate brown. Garnish with parsley.

Minced Mutton

Chop meat. Put into a frying pan, season with salt, pepper and celery salt. Dredge well with flour, stir, and add enough stock, or hot water, to make a gravy. Cook about 5 minutes. Pour over slices of toast.

Meat Soufflé

Make 1 c. white sauce, season with a little onion and parsley, add 1 c. finely chopped meat (veal or chicken preferred). Add yolks of two eggs well beaten. Cook 1 m. When cool fold in the beaten whites. Bake in a buttered baking dish about 20 m. in slow oven. Serve immediately. If for lunch, serve with mushroom sauce.

White Mushroom Sauce

Melt 2 tb. butter, add 2 tb. flour. When bubbling, add slowly $\frac{3}{4}$ c. milk and $\frac{1}{4}$ c. mushroom liquor. Season with salt and pepper. Add $\frac{1}{4}$ can of mushrooms, cut fine. When heated, serve.

Scalloped Chicken

Put a layer of chicken cut into small pieces into a baking dish, then a layer of white sauce; repeat, having white sauce for top layer. Cover with buttered crumbs and bake till brown.

Forcemeat Balls

See p. 67.

Croquettes

See p. 148.

Pressed Chicken

Chop cold boiled chicken fine, keeping the light and dark meats separate. Season with salt, celery salt, cayenne. Boil down the liquor in which the chicken was cooked and add to boiling liquid $\frac{1}{4}$ box of gelatine which has been soaked in $\frac{1}{4}$ c. cold water, and moisten the meat with it. Put a layer of dark meat in a square mold, then strips of tongue or ham, a layer of white meat, whole hard-boiled eggs, white meat, tongue, and dark meat as a last layer. Put a heavy weight on top and let stand for several hours. Remove from mold and cut in slices.

CHAPTER X

POULTRY AND FISH

COMPOSITION OF POULTRY (ATWATER)

	Refuse	Water	Protein	Fat	Ash
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Chicken, broiler	41.6	43.7	12.8	1.4	.7
Fowls	25.9	47.1	13.7	12.3	.7
Goose	17.6	38.5	13.4	29.8	.7
Turkey	22.5	42.4	16.1	18.4	.8

To select Poultry. — Soft yellow feet, smooth skin, soft cartilage at end of breastbone, pinfeathers, tender skin under the wing which is easily broken by bending back the wing, — indicate tender poultry.

Long hairs, long thin necks, flesh of purplish tinge, hard feet with sharp scales, — indicate tough poultry.

Cost of Chicken

(Students compile following facts from the weight of chicken used in lesson:)

Cost of chicken as purchased . . . . . .
Weight of chicken as purchased . . . . . .
Cost per pound as purchased . . . . . .
Weight after dressing . . . . . .
Weight of bones . . . . . .
(obtained after chicken has been cooked)
Weight of edible meat . . . . . .
(difference between dressed meat and weight of bones)
Cost per pound of edible meat . . . . . .

To prepare Poultry for Cooking. — Remove pinfeathers, singe to remove hairs, over a tb. alcohol burning in a saucer or over a blaze. Cut off head; cut the skin down the back of the neck, remove windpipe and crop. Cut neck off close to the body, leaving the skin long that it may be folded over on the back of the chicken in cooking. Cut through the skin below the leg joint without cutting the tendons. Place leg at end of board and break the joint; hold the fowl firmly in left hand and pull off the foot with tendons. In old birds, the tendons must be taken out one at a time, using a steel skewer. Make an incision below the breastbone and with the hand remove the entrails, gizzard, heart, and liver. The last three are called giblets. Do not break the gall bladder, which lies on the under surface of the right lobe of the liver. Remove carefully the lungs and kidneys, which lie in the hollow near the backbone. Remove the oil bag and wash the fowl by letting cold water run through it, but do not let it soak in cold water. Clean the giblets carefully.

To cut up a Chicken. — Singe, and remove the pinfeathers. Cut off the legs and wings at the joints. Cut from near the vent, through the membrane lying between the end of the breastbone and the tail, down to the backbone, on either side. Then remove the entrails. Break off the backbone just below the ribs. Cut through the cartilage dividing the ribs, and separate the collar bone from the breast.

Methods of Cooking Chickens

Young chickens.

(1) Broiled, (2) fried, (3) roasted.

Old chickens.

(1) Roasted, (2) boiled, (3) fricassee, (4) stew, (5) casserole.

Roast Chicken

Clean and stuff a chicken. Sew up the incisions. Rub all over with salt. Tie it into a compact shape, fastening the legs and wings close to the body; dredge with flour. Lay strips of salt pork over chicken. Place in a hot oven, and when the flour browns baste with boiling water every 10 m., using more water, if necessary, to prevent burning. Turn the chicken that it may brown evenly. When the breast meat is tender, the chicken is sufficiently cooked. Cook the giblets in water until tender.

Stuffing

Two c. crumbs, 2 tb. butter, or small piece salt pork chopped, salt, pepper, marjoram, summer savory, or thyme to taste, $\frac{1}{4}$ c. boiling water. Melt the butter in the water and pour over the crumbs to which seasoning has been added.

Chicken Gravy

Pour off all but about 4 tb. of fat from the pan in which chicken has been roasted. Add 5 tb. flour; when brown, add 2 c. of the water in which giblets have been boiled. Cook 5 minutes, season with salt and pepper, and if liked, add the giblets finely chopped.

Stewed Chicken

Dress, clean, and cut up a chicken. Put into a kettle with a few slices of salt pork and barely cover with boiling water. Boil 5 m., then simmer until tender. When about half done add 1 ts. salt. Cook a young chicken about $1\frac{1}{2}$ h., an old one 2 to $2\frac{1}{2}$ h. When done wet 4 tb. flour in cold water to form a smooth paste and stir into the boiling mixture. Season. Add 1 c. cream or milk and 2 tb. butter. When hot serve. Dumplings may be added.

Creamed Chicken

$1\frac{1}{2}$ c. cold chicken, diced
$\frac{1}{8}$ ts. celery salt
1 c. white sauce
$\frac{1}{4}$ c. mushrooms, sliced

Heat the chicken and mushrooms in the sauce over hot water. Serve on toast, in toast boxes, or patty shells.

FISH

Composition of Various Fish (Atwater.)

	Refuse	Proteid	Fat	Mineral Matter	Water
Black Bass	54.8	9.3	.8	.5	34.6
Bluefish	55.7	8.3	.5	.5	
Fresh Cod	52.5	8	.2	.6	
Salt Cod — boneless	....	22.2	.3	23.1	
Mackerel	44.6	10	4.3	.7	
Salmon	39.2	12.4	8.1	.9	
Trout	48.1	9.8	1.1	.6	40.4
Whitefish	53.5	10.3	3.	.7	32.5
Lobster	61.7	5.9	.7	.8	30.7

Fish should be fresh and be used in season. When fresh, the fish is firm, the eyes bright. White-blooded fish have fat secreted in the liver. Examples: whitefish, cod, haddock, perch, etc. Red-blooded fish have fat distributed throughout the flesh. Examples: salmon, mackerel, bluefish, herring. Broiling, boiling, baking, are the most wholesome methods of cooking fish.

Broiled Fish

Bone the fish, removing the head and tail. Wipe and dry, and sprinkle with salt and pepper. Place in greased broiler and broil the flesh side first; then turn and broil the skin side till brown and crisp. Loosen the fish from both sides of the broiler and slip on to a hot platter, flesh side up. Season with salt and pepper and butter, or spread with lemon butter. Garnish with parsley and lemon.

Planked Fish

Bone a fish. Lay it on a hot hardwood plank, flesh side up. Sprinkle with salt and pepper and bits of butter. Bake on upper

shelf in oven or under a gas broiler, about 30 m. or till brown. Ten minutes before it is done put a border of mashed potatoes around the fish, using a pastry bag and tube.

Put plank on a platter and garnish with parsley, shredded lettuce, radishes, lemon fans, etc.

Baked Fish

Clean, wash, and dry the fish. Do not remove the head or tail. Rub all over with salt, stuff, and sew up. Put two strips of cotton cloth in pan (if you have not a fish sheet), to help remove the fish when baked. Lay the fish in the pan and skewer into the shape of a letter S. Cut gashes on top and lay strips of salt pork in them and around the pan. Sprinkle the fish with salt and pepper, and dredge with flour. Put in a hot oven. When the flour begins to brown, baste with the fat in the pan and boiling water. The fish is done when the flesh separates easily from the bone. Bake about 1 hour.

Lift carefully on a hot platter, draw out skewers or strings, and serve with drawn butter or egg sauce.

Boiled Fish

Add the juice of $\frac{1}{2}$ lemon or $\frac{1}{4}$ c. vinegar to the water in which the fish is to be boiled. Put fish on a plate and tie all in a piece of cheesecloth. Put fish in boiling water and let simmer until the flesh separates easily from the bones. Add 1 tb. salt to water when fish is nearly cooked. Remove from plate and put on a folded napkin on a platter. Serve a sauce separately. Or, omit napkin and pour sauce over and around the fish.

Drawn Butter

1 pt. hot water or stock	4 tb. flour
6 tb. butter	$\frac{1}{2}$ ts. salt
	$\frac{1}{2}$ ssp. pepper

Put 4 tb. butter in the pan; when bubbling, but not brown, add the flour. Add hot water a little at a time. When thick and

perfectly smooth add seasoning and remainder of the butter. Stir till the latter is absorbed. Chopped hard-boiled eggs may be added.

Fried Fish

Clean fish and wipe as dry as possible. Roll in seasoned crumbs, dip in egg slightly beaten with 1 tb. water, and roll again in crumbs; or if preferred, dip in corn meal. Cook in a frying pan, in hot fat, till brown on both sides.

Large fish should be boned and cut in pieces for serving. To fry in deep fat see page 145.

Turbot

Steam a whitefish till tender. Remove bones and skin, and flake the fish. Sprinkle with salt and pepper. Make a white sauce with 1 pt. milk, 6 tb. flour and 4 tb. butter. Season with salt and pepper. When cool add 1 or 2 beaten eggs, 1 tb. each minced onion and parsley. Put layers of fish and sauce in a baking dish. Sprinkle top with buttered crumbs and bake till brown.

Creamed Codfish

Pick salt codfish in small pieces, cover with cold water, heat, and let simmer till tender. Drain and cover with milk. When boiling thicken with flour and butter rubbed together in the proportion of 2 tb. of each to every cup of milk. Just before serving add 1 beaten yolk of egg. Cook 1 m.

Fish Balls

1 c. raw salt fish	1 egg well beaten
1 pt. potatoes	$\frac{1}{4}$ ssp. pepper
1 ts. butter	More salt if needed

Shred the fish. Pare and quarter potatoes. Put fish and potatoes in stewpan and cover with boiling water. Boil 25 m. or till potatoes are soft. Do not boil too long or they will be soggy.

Drain well. Mash and beat till very light. Add butter and pepper, and when slightly cool, the beaten egg. Shape in a tb. and drop in a kettle of smoking hot fat. Fry only a few at a time, or they will cool the fat. Drain on brown paper. Or, shape into flat cakes, roll in flour, and sauter in hot fat.

Salmon in Mold

1 can salmon
3 eggs, beaten light
4 tb. melted butter
½ c. fine bread crumbs
Salt, cayenne, parsley

Remove oil, bones and skin from fish. Mince fish fine. Rub in the butter till smooth. Add crumbs to beaten egg. Season the fish. Add eggs and crumbs. Put into a buttered mold, cover the mold, and steam 1 h. Serve with sauce.

Sauce for Salmon

Make a sauce with 1 c. boiling milk, 1 tb. flour, and 2 tb. butter. Add liquor from the salmon. Season with salt, cayenne, 1 ts. tomato catsup. Just before taking from fire add 1 beaten egg.

Sardines on Toast

Drain sardines. Cook in a chafing-dish till heated, turning often. Place on small oblong pieces of toast and serve with lemon butter. Or, lay sardines on toast and heat in a moderate oven.

Lobster Farci

1 pt. can lobster
1 pt. milk
4 tb. butter
6 tb. flour
Salt and cayenne

Melt the butter, add flour, and when bubbling add milk gradually. When thick and smooth add lobster, which has been picked fine. Season. Put in buttered shells. Cover with buttered crumbs and bake till brown.

Escalloped Oysters

1 pt. oysters	$1\frac{1}{2}$ c. crumbs
4 tb. oyster liquor	$\frac{1}{3}$ c. butter melted
6 tb. milk or cream	Salt and pepper

Stir the melted butter into the crumbs. Put a thin layer in bottom of a buttered baking dish, cover with oysters, and sprinkle with salt and pepper, add part of the milk and oyster liquor. Repeat, and cover the top with crumbs. Bake 40 m. in hot oven. Two layers of oysters are sufficient; if more be used, the center layer will be underdone.

Creamed Oysters

Wash, by pouring over them $\frac{1}{4}$ c. water, and look over 1 c. oysters. Parboil them in the oyster liquor and the water in which they were washed, until the edges curl and the oysters are plump. Drain.

Make a white sauce with

3 tb. butter	$\frac{1}{4}$ c. oyster liquor
3 tb. flour	$\frac{1}{2}$ ts. salt
$\frac{3}{4}$ c. milk	$\frac{1}{2}$ ssp. pepper

Add the parboiled oysters and cook till hot. Serve on toast, in toast boxes, or patty shells.

Toast Boxes

Cut stale bread into 2 inch cubes, trim the crust, take out the center, leaving the bread in the form of a box. Brush with melted butter and bake in a quick oven until a light brown.

Fill with any creamed mixture.

CHAPTER XI

MILK AND MILK PRODUCTS

AVERAGE COMPOSITION OF MILK (SNYDER)

Water	Fat	Casein	Albumen	Lactose	Ash
87.0%	3.5%	3.25%	0.5%	5.0%	0.75%

Milk is the food of the young animal, and hence contains all the nutrients necessary for the support of the body. Owing to the large per cent of water in its composition, milk is a bulky food, and being deficient in starch, is not a satisfactory food for the healthy adult.

Milk is a white, opaque liquid. It consists of a bluish white liquid, called serum, in which float globules of fat, which give the milk the appearance of a white liquid. These fat globules are suspended through the milk in the form of an emulsion, fresh milk being the most perfect example of an emulsion. Upon standing, however, the emulsion is broken and the fat rises to the surface in the form of cream.

Butter is made by separating the fat from cream by churning, thus completely breaking down the emulsion of fat. Skimmed milk contains practically all the ingredients of whole milk with the exception of the fat, and forms a cheap supply of protein. The protein of the milk is largely in the form of casein, which contains both sulphur and phosphorus.

Casein coagulates when an acid is added to it, or when an acid is formed in the milk during the process of lactic fermentation. It forms a clot in the stomach by the action of the enzyme rennin, which is secreted by the stomach, and it then digests as a solid food. In cheese making and in the making of junket, a commercial form of rennin obtained from the second stomach of the calf is added to the milk, thus causing it to clot. The addition of limewater, or some cereal water, as barley water, tends to make the casein form a lighter and more digestible clot, hence they are often added to baby foods.

The albumen of milk, or lact-albumen, coagulates with heat and forms the scum of boiled milk.

Lactose, or milk sugar, is less soluble than cane sugar and does not taste as sweet. It is the sugar which is used in baby foods. It is obtained from the whey left from cheese making after the casein and fat have been removed.

The souring of milk is caused by the action of lactic bacilli present in the milk. The bacilli feed upon the lactose changing it to lactic acid, which acid reacts upon the casein, causing it to coagulate, or form a curd. In the large intestine of the human body are found great numbers of bacteria which feed upon the food residue present there, forming injurious compounds which are absorbed by the blood, with harmful results. The growth of some of these putrefactive bacteria is thought to be checked by the presence of lactic acid and by the action of lactic bacilli; hence, sour milk is considered a healthful, as well as a nutritious food.

The mineral matter in milk consists largely of the phosphates and chlorides of soda, lime, and potash.

Milk contains large numbers of bacteria. Few bacteria are normally present in fresh milk, but they enter the milk on account of the unsanitary conditions attendant upon

milking and the subsequent care of milk. They reproduce very rapidly if the milk is not cooled. Typhoid fever, children's summer diseases of the intestines, tuberculosis, and other diseases are often traced to the milk supply; consequently, the most cleanly conditions should be insisted upon by the health authorities, in the stable, the care of the cow, cleanliness of the milkers and of all utensils which hold the milk. Milk should be sold only in bottles which are filled and sealed at the dairy, the seal to be broken by the consumer only.

EXPERIMENT 45. — Put a drop of cream on filter paper; when dry, note the characteristic grease spot. This is a test for fat.

EXPERIMENT 46. — Fill a tall cylinder with milk, and determine the specific gravity with a lactometer.

EXPERIMENT 47. — Examine a drop of milk under microscope. Explain appearance and make a drawing of the fat globules seen.

EXPERIMENT 48. — To $\frac{1}{2}$ c. milk warmed to 100° F. add $\frac{1}{8}$ of a rennet tablet dissolved in $\frac{1}{2}$ ts. water. Mix quickly. Let stand in a warm place until the milk clots. Break the clot lightly and put into a filter paper. Test the curd or casein for protein. (See protein test, page 69.)

EXPERIMENT 49. — Test the filtrate from above experiment with Fehling solution for sugar.

BUTTER

Butter is made by separating the fat globules of cream by churning, after the cream has soured from the action of bacteria.

COMPOSITION OF BUTTER (J. C. Olsen)

FAT	WATER	SALT	SUGAR
84 %	12.8 %	2 %	0.4 %

Butter fat is one of the most palatable, easily digested, and easily assimilated forms of fat. Its flavor is due to bacterial action. In the modern creamery all conditions are most sanitary; bacteria which give a disagreeable odor and taste to butter are not present. Butter is artificially colored, but the coloring is harmless.

Renovated butter is butter which has become rancid and is then subjected to a process of renovation, by which the disagreeable odors and flavors are removed. It is not an unwholesome product, but should not be sold at butter prices. Most states require that it be plainly marked "renovated" or "process" butter.

Oleomargarine or Butterine. — The manufacture of these butter substitutes is carried on under government inspection, and the products are clean and wholesome, lacking, however, the delicate flavor of butter. They are manufactured from a high grade of lard, cottonseed oil, and milk, and a small amount of butter is generally added for flavor. There is no objection to their use in cookery, and when they are sold under their true names and at a reasonable price, they are good substitutes for butter in cooking.

EXPERIMENT 50. — *Foam test to distinguish butter from oleomargarine.* Melt in separate dishes butter, oleomargarine, and renovated butter. The butter boils quietly and produces considerable foam, while the other two sputter and crackle violently, producing but little foam.

EXPERIMENT 51. — Beat one pint of ripened cream with an egg-beater or whip churn until the butter fat separates. Collect these lumps and form into a mass. Wash in cold water to remove any milk; drain off the water. Add salt to taste. Weigh the butter and estimate the cost. How much cream would be required to make one pound of butter? What is the composition of buttermilk?

CHEESE

Average Composition of Cheese (Atwater)

Water	Protein	Fat	Carbohydrates	Ash
34.2 %	25.2 %	33.7 %	2.4 %	3.8 %

Cheese is made from whole milk, from milk plus cream, from cream, and from skim milk. The casein is precipitated by the action of rennet, forming a curd to which most of the fat attaches itself. The curd is then broken up and the whole heated to about 108° F. The whey is drained off, carrying with it most of the lactose and albumen. The curd is salted and pressed. It is then kept for several weeks or longer to develop flavor, or ripen by the action of bacteria. The texture of the cheese also changes in ripening.

As a food, cheese is used in small amounts as a flavor, and in large amounts as a highly nutritive protein food. The lower-priced cheeses are an important source of protein and fat in the diet and make good meat substitutes. It has been shown that cheese is not difficult of digestion for the majority of persons.

Experiment 52. — (*a*) Heat a small piece of cheese in a pan directly over the fire until it melts. Let boil and note results.

(*b*) Melt a similar piece of cheese in a pan over hot water, removing from water as soon as it melts.

Compare the texture of results of (*a*) and (*b*). Should cheese be cooked at a high or low temperature? What food principle must be considered in cooking cheese?

The Care of Cheese. — Wrap the cheese in a slightly dampened cloth or in paraffin paper and then in a heavier paper. Cheese molds more readily when it is put in a covered

dish with the air excluded. Cheese contains a large per cent of protein, so should not be raised to a high temperature in cooking. Many palatable dishes can be prepared from cheese but since it is deficient in starch, some starchy food is usually added to it, as macaroni, rice, bread, etc.

Cottage Cheese

Set a dish of thick sour milk in a pan of lukewarm water (100°). When the curd is well set, strain off the whey through a cheese cloth. Work the curd with a fork or potato masher until fine-grained. Season with salt and moisten with cream. Shape into small cakes suitable for serving. Chopped parsley, pimentos, or olives may be added to vary the flavor.

Welsh Rarebit No. 1

¼ lb. rich cream cheese	1 egg
¼ c. milk or cream	4 slices of toast or wafers
¼ ts. mustard	Speck of cayenne

Cut the cheese in small pieces and melt over hot water, in chafing dish or double boiler. Add milk and stir rapidly. Add the seasoning to the beaten egg, stir in slowly and cook till it thickens a little, but do not let it curdle. Pour over the toast or wafers.

Welsh Rarebit No. 2

Melt cream cheese in double boiler or chafing dish. Add milk or cream slowly to thin. Season with cayenne and mustard and stir in a beaten egg. When smooth pour over toast or wafers. Do not overcook the cheese.

American Rarebit

Soak 1 c. grated bread crumbs in 1 c. milk fifteen minutes. Melt 2 tb. butter in chafing-dish, add 1 c. grated or broken cheese. When cheese is melted, add the bread and milk, 1 egg well beaten, salt and cayenne to taste. Stir rapidly, and when smooth serve on toast or crackers.

Cheese Fondue

1 c. scalded milk	1 tb. butter
1 c. soft stale bread crumbs	¼ ts. salt
¼ lb. mild cheese cut fine or grated	¼ ts. mustard
	Few grains cayenne

Add above ingredients to hot milk. When well mixed, remove from fire and add 2 beaten yolks of eggs. Fold in 2 beaten whites. Put into a buttered earthen baking dish, and bake twenty minutes in a moderate oven. Serve immediately, as it will fall if it stands.

CHAPTER XII

WATER AND BEVERAGES

WATER is composed of hydrogen and oxygen, its chemical formula being H_2O. Water is very widely distributed in nature; it covers three-fourths of the earth's surface, and is present in the soil and rocks and in all animal and vegetable organisms. The human body is composed of about 70 per cent water. The body obtains its water supply from foods and beverages, and a small amount of water is formed chemically in the body by the oxidation of the hydrogen of foods.

Water is a very important solvent, dissolving many substances. It also holds many organic substances in suspension. Water which is chemically pure contains no foreign substance of any kind. Distilled water or condensed steam is the only chemically pure water. Water that is hygienically pure contains no substance which is injurious to the health of those drinking it.

Harmful or disease-producing bacteria and decaying animal and vegetable matter are the chief sources of water contamination, although the presence of many chemicals makes it unfit for drinking. The disease-producing bacteria most commonly found in drinking water are the typhoid bacilli. Many cases of typhoid fever may be traced to the water supply or to milk which has been diluted with impure water. The common house fly has been found to be a carrier of the typhoid bacillus and should never be allowed to settle on food or on utensils which hold it.

Sources of Water. — 1. Rain water. 2. Springs. 3. Rivers and lakes. 4. Surface wells. 5. Deep or artesian wells.

Rain water takes up the dust and gases from the air, and organic matter from the roofs over which it is collected. The long storing in a cistern gives bacteria opportunity to grow in large numbers, causing the water to be unsafe for drinking purposes.

Springs are a source of pure water supply if they are not contaminated by passing through soil which is polluted.

Rivers and lakes are a common source of water supply, but they may be made very unfit for drinking if the surface water and sewage from towns and cities is allowed to drain into them.

Surface wells are a very unsafe source of drinking water supply, and the water should never be used when there are cesspools, drains, barnyards, or any other sources of contamination within a radius of 200 feet of them.

Deep artesian wells furnish pure water as a rule, unless the piping is not tightly jointed, when impure water from a subsoil stream near the surface may enter the pipes.

Methods of Purification of Water. — 1. Boiling. 2. Filtration. 3. Distillation.

Boiling is a certain method of destroying bacteria. If there is the slightest doubt as to the purity of the water, it should be boiled for twenty minutes and then be quickly cooled. It should be put into perfectly clean bottles, tightly stopped, and be placed on or near the ice.

Filtration. — The modern filter contains a hollow tube of unglazed porcelain, which is porous and through which the water percolates slowly. All mechanical impurities of the water are deposited on the surface of the tube. These impurities usually carry the bacteria, which are thus removed.

The tubes should be washed often, and occasionally be removed from the filter to be baked or steamed.

Charcoal is used in many filters, as it removes all color, odor, and taste from the water by holding back the organic matter; but the charcoal may soon become a source of contamination, as bacteria will grow rapidly in the organic matter present.

Many cities purify the water supply by precipitating the organic matter present by the addition of iron sulphate, alum, or calcium hydrate. The bacteria are entangled in the precipitate, which is then filtered out by mechanical filtration through sand and gravel.

Distillation is the process of condensing steam. The water thus obtained is the only chemically pure water.

Ice. — Freezing has little effect upon bacteria except to lessen temporarily their vitality. When the ice melts, the bacteria may again become active. Ice made by artificial means from distilled water is the only pure ice. For cooling drinking water, the water should be placed on the ice and the ice should not be put into the water.

Hard and Soft Water. — Soft water is water in which no mineral matter is dissolved. Hard water is water in which such minerals as lime, magnesium, and iron are dissolved. Boiling precipitates some of the mineral matter, thus tending to soften the water. This mineral deposit may be seen on the inside of a teakettle. Hard water that is to be used for cleansing purposes may be softened by the addition of washing soda, borax, ammonia, potash, or soda lye.

BEVERAGES

Pure water ranks as the first and most important of beverages. An adult should drink about three pints of water a day. Tea and coffee are stimulants, furnishing

no real nutriment to the body, as they give neither heat nor energy, nor do they build tissue. If taken in excess, tea and coffee tend to produce nervousness, insomnia, palpitation of the heart, etc.

The stimulating property of coffee and tea is due to caffeine. They also contain tannin, an astringent, which is drawn out by boiling and which is injurious to the digestive organs. Tea and coffee should not be given to children. Cocoa and chocolate contain protein, fat, and starch, hence have a food value in addition to the milk added in making a beverage. They form a valuable hot beverage for children. Cocoa also contains theobromine, which is of like nature to caffeine, but is a milder and less harmful stimulant.

EXPERIMENT 53. — (*a*) Pour 1 c. cold water on $\frac{1}{2}$ ts. tea. Let stand one-half hour. Strain and heat.

(*b*) Pour 1 c. boiling water on $\frac{1}{2}$ ts. tea. Let stand three minutes in warm place.

(*c*) Pour 1 c. boiling water on $\frac{1}{2}$ ts. tea and boil five minutes.

(*d*) Put $\frac{1}{2}$ ts. tea in fine strainer (tea ball) and pour 1 c. boiling water through it.

Compare results as to strength, flavor, color. Reserve part of each for the next test.

EXPERIMENT 54. — Fill four test tubes $\frac{1}{4}$ full of each of the above solutions, add slowly to each a saturated solution of cupric acetate until the liquid is a light green. Boil. Allow the precipitates to settle and compare amounts. This will indicate the relative amounts of tannin present. Which of the above methods should be used in making tea? Which avoided?

EXPERIMENT 55. — (*a*) Pour $\frac{1}{2}$ c. boiling water through 1 tb. fine coffee placed in a fine strainer, or in cheesecloth.

(*b*) Boil 1 tb. coffee and $\frac{1}{2}$ c. water ten minutes.

Compare results as to flavor and strength. Test results of (*a*) and (*b*) as in Experiment 54 for tannin.

EXPERIMENT 56. — (*a*) Pour $\frac{1}{2}$ c. boiling water on $\frac{1}{2}$ ts. tea.
(*b*) Pour $\frac{1}{2}$ c. hot water on $\frac{1}{2}$ ts. tea.

Let both stand five minutes. Compare strength, color, flavor. Which is the best solvent for tea, hot or boiling water? Are there tea leaves floating on the surface when the hot water is used? When boiling water is used?

NOTE. — Students bring cost price of several leading brands of tea, coffee, chocolate, and cocoa.

Cost of Tea. — Weigh $\frac{1}{4}$ lb. tea. Measure the number of teaspoonfuls it contains. Estimate the number of cups of tea that may be prepared from 1 lb. Estimate cost per cup of teas of different prices.

Cost of Coffee. — Weigh out $\frac{1}{4}$ lb. coffee. Measure the number of tablespoonfuls in it. Estimate the number of cups of coffee that may be prepared from 1 lb. Estimate cost per cup of different priced coffees.

Coffee. — The coffee tree is native to Abyssinia, but is now grown in all tropical countries. The coffee bean is the seed of the tree and is found in the cherrylike fruit. When the fruit begins to shrivel on the trees, it is shaken to the ground, is then dried, and the seeds separated by wooden rollers. The green coffee berry has but little flavor, but when roasted a characteristic flavor and odor are developed.

Care of Coffeepot. — Never put the coffee or tea pot in the water in which other dishes have been washed. Have a small mop kept especially for the coffeepot. After using, empty the pot, and with clear hot water thoroughly wash the pot and spout, with the aid of the mop. Twice a week fill the pot with cold water, add 1 tb. washing soda, and boil about ten minutes. Rinse well. Never let the brown sediment accumulate in a coffeepot, or the flavor of the finest coffee will be ruined.

Boiled Coffee

½ c. coffee	½ egg
½ c. cold water	3½ c. boiling water

Scald a granite ware coffeepot. Wash egg, break, and beat slightly. Add the egg and shell and half the cold water to the coffee. Put into the coffeepot, pour on the boiling water. Place on front of range and boil slowly three to five minutes. Pour some of the coffee into a cup to free the spout from grounds, return to the coffeepot, and repeat. Add remaining cold water, which being heavier than hot water sinks to the bottom carrying the grounds with it, and completes the process of clearing. Place on the back of the range, where it will not boil, for ten minutes. Three eggshells may be used in place of 1 egg. For after-dinner coffee use twice the amount of coffee given in this recipe.

Filtered Coffee

Use a French coffeepot. Scald it with hot water. Put 2 rounding tb. powdered coffee in the bag and pour over it 1 pt. freshly boiling water. Keep the pot hot until the water has filtered through; pour it off and turn back through the filter again. Less tannin is extracted by this method than by boiling.

Tea. — Black tea comes from China, India, and Ceylon. Some of the familiar brands are Oolong, English Breakfast, Formosa, and Orange Pekoe. Black tea is made from the leaves which have been allowed to ferment by exposure to the air before curing.

The best green tea comes from Japan. Some of the familiar brands are Gunpowder, Hyson, and Japan. Green tea is made from young leaves of the tea plant, dried quickly by artificial heat. Both black and green tea may be made from the same plant, according to the method of curing.

Tea leaves are rich in protein, but when taken as an infusion act as a stimulant rather than a nutrient. The tannic

acid developed from the tannin by infusion injures the coating of the stomach. Tea should never be boiled nor steeped for any length of time, as the tannic acid will be extracted in greater amount. Freshly boiling water should always be used to pour on the tea.

Tea

Scald an earthen or china teapot. Put in 1 ts. tea and pour over it 1 pt. freshly boiling water. Let stand five minutes in a warm place. Serve immediately.

Russian Tea

Serve a slice of lemon in each cup of tea with sugar to taste. In Russia a preserved strawberry is added to each cup. A clove and a cherry may be put in each cup for afternoon tea.

Cocoa and Chocolate. — The cocoa tree is a native of Mexico; it also grows in Central and South America and the West Indies. Cocoa and chocolate are both prepared from the seeds of the cocoa bean. The fruit is shaped like a large, thick cucumber, and contains from twenty to forty seeds. These are roasted like coffee. The husks or shells are taken off and used in that form as cocoa shells. The various preparations of cocoa are made from the ground beans, from which the fat or oil has been extracted. Chocolate contains a larger proportion of fat, it is mixed with starch and pressed into cakes.

Chocolate

1½ sq. Baker's chocolate	1 c. water
4 tb. sugar	3 c. milk

Add water to the chocolate and stir over the fire till it boils; add sugar and milk. Bring to the boiling point, boil five minutes, whipping with an egg-beater. Serve.

Cocoa

3 tb. prepared cocoa	2 c. boiling water
4 tb. sugar	2 c. milk

Mix sugar and cocoa, and add $\frac{1}{2}$ c. of the boiling water to make a smooth paste. Add remaining water and let boil five minutes. Add the milk and when this is scalded, beat with an egg-beater for a few minutes and serve.

NOTE. — Interesting exhibits of cocoa and chocolate may be obtained from chocolate manufacturers.

Cost of Cocoa. — Measure the number of teaspoonfuls of cocoa in a box. Estimate the number of cups of cocoa it will make and the cost per cup, including the milk used. Estimate the cost per cup of chocolate.

CHAPTER XIII

LEAVENING — BATTERS AND DOUGHS

Methods of Making Mixtures Light. — 1. Incorporation of Air.

Physical change. — Air expands when heated.

Methods: (*a*) By beating mixture.

(*b*) By adding beaten eggs.

2. Steam.

Physical change. — Steam occupies 1600 times more space than the water which produced it.

Methods: (*a*) Moisture, as in pop-overs.

(*b*) Snow pancakes.

3. Fermentation.

Chemical change. — CO_2 liberated.

Methods: (*a*) Yeast.

(*b*) Salt-rising bread.

4. Acid and Alkali.

Chemical change. — CO_2 liberated.

Methods: (*a*) Baking powder.

(*b*) Soda and an acid, as cream of tartar, sour milk, molasses.

Experiment 57. — Make a solution of $\frac{1}{2}$ ts. soda and $\frac{1}{4}$ c. water. Taste. Test with litmus paper.

Name some of the properties of an alkali. Test various washing powders with litmus paper. Are they alkalies?

Experiment 58. — Make a solution of 1 slightly rounding ts. of cream of tartar and $\frac{1}{4}$ c. water. Taste. Test with litmus paper. Name some of the properties of an acid. Test lemon, vinegar, molasses, etc., with litmus paper. Are they acids or alkalies?

Experiment 59. — Put solutions of experiments 57 and 58 together. What causes the effervescence? Taste. Test with litmus paper. What effect have the acid and alkali had on each other? Is the result acid or alkaline? What causes the salty taste? What is formed by the union of an acid and alkali?

Experiment 60. — Make a solution of alum and water. Taste. Test with litmus paper. Has the alum an acid or alkaline reaction? Is it substituted for the cream of tartar or for the soda in baking powder? Add soda to the alum solution; what is the result? What effect did it have upon the tongue? Is alum a healthful ingredient in baking powder?

Experiment 61. — Test sour milk with litmus paper. Is it acid or alkaline? Add a little soda; what is the result? Repeat with molasses, brown sugar, chocolate.

Experiment 62. — Mix baking powder with water; what is the result? Warm gently. Is the chemical action increased by heat? Test with litmus paper. Is the reaction either acid or alkaline? Taste. What has been formed by the union of soda and the acid?

Experiment 63. — Pass the gas given off when soda and cream of tartar solutions are put together through limewater; what gas is formed? Test the gas given off when baking powder is moistened with water. What gas is generated when an acid is added to bicarbonate of soda?

Baking Powders. — Baking powder is composed of bicarbonate of sodium, $NaHCO_2$, which has in its composition carbon dioxide and some acid. When the mixture is wet, the acid serves to liberate the carbon dioxide from the sodium bicarbonate. In order to keep those materials dry and to prevent chemical action from taking place before they are used, starch is added and is called a "filler." In cheap baking powders the starch is added in very large amounts. The value of a baking powder depends upon the amount of gas it gives off. Its healthfulness

depends upon its freedom from injurious residue left in the food.

There are three classes of baking powder upon the market:

1. Cream of Tartar.
2. Phosphate.
3. Alum.

Cream of tartar is potassium acid tartrate, $KHC_4H_4O_6$. It is prepared from the argols which collect on the inside of wine casks. These are then refined and purified and known as cream of tartar.

The chemical reaction of cream of tartar baking powder is as follows:

potassium acid tartrate	+	bicarbonate of sodium	=	Rochelle salt	+	carbon dioxide	+	water
$HKH_4C_4O_6$	+	$NaHCO_3$	=	$KNaC_4H_4O_6$	+	CO_2	+	H_2O

There is left as a residue in a loaf of bread made from baking powder more Rochelle salt than is found in a Seidlitz powder; but the amount eaten at any one time is so small as to have very little physiological effect.

Cream of tartar is expensive, so cheaper forms of acid are often used in baking powders.

Phosphate Baking Powders. — The acid used is phosphoric acid, which is obtained by the action of sulphuric acid on ground bone. The phosphate probably has little power to furnish phosphate to the body, not being in a form in which the body can assimilate it.

Alum Baking Powders. — These are the most objectionable forms of baking powders, as their residue has an irritating effect upon the mucous membranes of the digestive organs. They are very cheap powders, so, unfortunately, they are extensively used.

Bicarbonate of sodium is obtained from common salt, is a very cheap product, and, therefore, is not adulterated.

Proportions of acid and alkalies to be used in cooking:

1 ts. soda and 2 slightly rounding ts. of cream of tartar for 1 qt. flour.
2 ts. baking powder for each c. flour.
1 ts. soda for 1 pt. thick sour milk.
1 ts. soda to 1 c. molasses for batters.
½ ts. soda to 1 c. molasses for a stiff dough.

Baking powder may be substituted for cream of tartar and soda, in the proportion of 2 level ts. for each c. flour or meal.

Reduce the amount of baking powder by ½ ts. for each egg added to the mixture.

Batters and Doughs. — A batter is a mixture of flour and some liquid.

A thin batter is made in the proportion of 1 scant measure of liquid to 1 full measure of flour.

A drop batter or muffin mixture is in proportion of 1 scant measure of liquid to 2 full measures of flour.

A dough is 1 measure of liquid to 3 scant measures of flour.

A sponge is a drop batter to which yeast is added.

Construction rule for baking powder mixtures:

2 c. flour or 1 c. white and 1 c. rye, graham, etc.
4 ts. baking powder; reduce ½ ts. for each egg added.
½ ts. salt.
1 to 4 tb. shortening.
1 scant c. milk.
1 or 2 eggs, if desired.
1 to 4 tb. sugar.

Baking Powder Biscuit

2 c. flour
4 ts. baking powder
2 tb. lard or butter
1 scant c. milk
½ ts. salt

Mix and sift dry ingredients. Work in lard with tips of fingers; add the milk gradually to form a soft dough, mixing with a knife. Toss on a floured board, roll lightly to ¾ inch thickness. Cut in rounds. Bake in a very hot oven 12 to 15 minutes.

For shortcake use 4 tb. shortening.

Scones

Make as baking powder biscuit, using 4 tb. shortening, and adding 1 beaten egg to the milk. Roll dough thin, cut, brush the top of each scone with a little melted butter, and sprinkle with sugar and cinnamon. Put a piece of citron or candied orange peel in center, and bake.

Dutch Apple Cake

2 c. flour
½ ts. salt
3½ ts. baking powder
¼ c. butter
1 egg
1 scant c. milk
2 sour apples

Mix dry ingredients, rub in the butter, add milk and beaten egg. Spread ½ inch thick on a shallow pan. Pare and cut apples in sections lengthwise; lay in rows on the dough with the sharp edge pressed lightly into the dough. Sprinkle the top with 2 tb. sugar and ¼ ts. cinnamon. Bake in a hot oven 25 to 30 minutes. Serve hot, with lemon sauce or with butter.

Lemon Sauce

2 c. hot water
1 c. sugar
Grated rind and juice of 1 lemon
2 tb. butter
3 tb. cornstarch

Mix the cornstarch and sugar. Stir slowly into the boiling water. Cook 10 minutes. Add the lemon and butter. Serve.

Pin-wheel Biscuit

2 c. flour
4 ts. baking powder
½ ts. salt
2 tb. sugar
2 tb. lard
⅓ c. stoned raisins
2 tb. chopped citron
⅓ ts. cinnamon

Mix as a baking powder biscuit dough. Roll ¼ inch thick. Brush with melted butter, sprinkle with the raisins cut fine, citron, sugar, and cinnamon. Roll like a jelly roll. Cut in slices 1 inch thick. Bake in a hot oven 15 minutes. Currants may be used in place of raisins and citron.

Orange Shortcake

Make a baking powder biscuit dough. Roll into a cake ¾ inch thick and bake in a quick oven. Split carefully. Spread with butter. Spread with oranges cut in small pieces and sweetened. Put another layer of oranges on top of the cake or sprinkle top with powdered sugar.

Corn Bread

1 c. corn meal
1 c. flour
3½ ts. baking powder
½ ts. salt
¼ c. sugar
1 egg
1 c. milk
2 tb. melted butter

Mix the dry ingredients, add milk, beaten egg, and butter. Beat well. Bake in a shallow pan in a quick oven twenty minutes. Serve hot.

Corn Meal Muffins

Mix as corn bread, baking in muffin pans 25 minutes.

Graham Gems

1 c. graham flour
1 c. flour
1 c. sour milk
2 tb. butter, melted
⅓ c. molasses
¾ ts. soda
½ ts. salt

Mix and sift dry ingredients; add milk to molasses, combine mixtures, and bake in hot muffin pans 25 to 30 minutes.

Rice Muffins

3 c. flour	2 tb. sugar
½ ts. salt	1 pt. milk
5 ts. baking powder	½ c. cooked rice
2 eggs	2 tb. butter

Mix and sift dry ingredients. Add milk to beaten eggs; stir into the mixture, beat well, and bake in hot, greased muffin pans 25 minutes.

Nut Bread

4 c. flour	1 ts. salt
7 ts. baking powder	¾ c. brown sugar

Mix well together and add 1½ c. milk, to which has been added 1 well beaten egg. Add 1 c. chopped nut meats. Bake in a greased brick loaf pan ¾ hour.

Brown Nut Bread

½ c. molasses	1 ts. salt
1 ts. soda	1 ts. cream of tartar
2 c. milk	½ c. sugar
2 c. graham flour	1 c. nuts, chopped
1½ c. white flour	

Add the soda to the molasses and beat until it foams. Add milk, then the dry ingredients mixed together. Add the nuts. Fill pound baking powder cans, greased, one half full, cover, let rise one half hour; bake ¾ hour in a moderate oven.

Boston Brown Bread

1 c. rye meal	2 c. sour milk
1 c. corn meal	2 ts. soda
1 c. graham flour	1 ts. salt
¾ c. molasses	

Mix and sift dry ingredients, add molasses and milk, beat well, put into well-buttered molds, and steam 4 or 5 hours. The cover should be buttered. Never fill the mold more than two thirds full. Baking powder cans or lard pails may be used for molds. Bake ½ hour after taking from steamer.

Pop-overs

1 c. flour
1 c. milk (scant)
1 ssp. salt
1 egg

Add milk slowly to salt and flour till a smooth paste is formed. Add remainder of milk and the egg. Beat the mixture well and bake in hot gem pans, filling them two thirds full. Bake 30 minutes. Have the oven very hot at first and then reduce temperature. If removed from the oven before they are thoroughly baked, they will fall.

Gingerbread

½ c. lard
Yolks of 1 or 2 eggs
½ c. milk
1½ c. molasses
3 c. flour
1 ts. soda
2 ts. ginger
½ ts. salt
Whites of 2 eggs

Mix in the order given, sifting the dry ingredients together, and folding in the beaten whites last. Bake in a moderate oven 45 minutes. Mixtures which contain molasses burn easily, so should be baked in a moderate oven.

Griddle Cakes

The griddle for baking cakes should be perfectly clean and smooth. If 1 or 2 tb. of melted shortening is added to the batter, the cakes may be cooked without using grease of any kind on the griddle. If grease is used, take a piece of salt pork, or tie a cloth on a short stick or fork, and grease with drippings or lard. Never leave pools of fat on the edge of the griddle to burn. Wipe off the griddle with a cloth after each baking.

Sour Milk Griddle Cakes

2⅛ c. flour
½ ts. salt
2 c. sour milk
1 egg
1 ts. soda

Sift dry ingredients; add sour milk and well-beaten egg. Drop by spoonfuls on a hot greased griddle. When full of bubbles, turn and bake the other side.

Bread Griddle Cakes

1 pt. stale bread crumbs — 1 pt. milk, scalded
2 tb. butter

Pour the hot milk over the crumbs and butter and soak till soft. Add 1 beaten egg, 1 c. flour, ½ ts. salt, 2 ts. baking powder. Cold milk to thin if necessary. Bake on a hot griddle.

Waffles

1 pt. flour	2 eggs
3 ts. baking powder	1¼ c. milk
½ ts. salt	2 tb. butter, melted

Mix in order given, adding milk with the beaten yolks, then butter, and last fold in the beaten whites. Bake in hot waffle pans.

Caramel Syrup

Melt 1 c. granulated sugar till a light brown, but do not let it burn. Add 1 c. boiling water and simmer 10 minutes. Serve with waffles or hot cakes.

Sugar Syrup

1 c. sugar — ¾ c. water

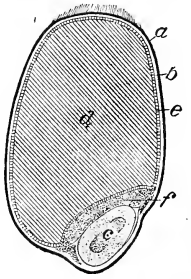
Boil together slowly for 10 minutes and serve with hot cakes. One tb. lemon juice may be added.

CHAPTER XIV

BREADS

NOTE. — Student write a paper giving the history of bread making; varieties of bread used by different nations; primitive and modern methods of milling; commercial importance of wheat, of flour, and of the different cereals used for bread making; world's production of wheat.

SECTION OF GRAIN OF WHEAT



(*a*) Skins and testa (bran).
(*b*) Membrane (bran).
(*c*) Embryo.
(*d*) Endosperm.
(*e*) Cerealin or aleurone layer.
(*f*) Scutellum.

Wheat. — The wheat plant belongs to the grass family. The part that is used for food is the fruit or seed. This consists of three parts:

(1) The germ, or embryo, which is the part of the seed that reproduces. It is composed of cellulose, protein, sugar, and a large proportion of fat.

(2) The kernel, or endosperm, which is the central part of the grain. It consists of a cellular structure, which holds the starch granules, some protein, and sugar.

(3) The bran or outer covering, which is composed largely of cellulose and mineral matter, and contains a pigment or coloring matter. The bran forms a protective covering for the wheat grain and is made up of six layers. The five outer layers contain little but cellulose and mineral matter, but the innermost layer consists of rectangular cells filled with a protein called cerealin, or aleurone, and is the part of the grain which is richest in protein.

In the early methods of milling, this layer was removed with the bran, but the modern methods make it possible to separate the outer bran layer, retaining the aleurone layer, thus making what is known as entire wheat flour.

Graham flour is made by grinding all of the wheat with the exception of the embryo. It thus contains the bran. It is useful when coarse food is needed to stimulate the action of the large intestine to prevent constipation. The bran itself may be made into cookies, etc., and eaten for this purpose.

Protein in Wheat. — Wheat is the most important grain used for bread making on account of the physical properties of two of its proteins, called gliadin and glutenin. When mixed with water, these substances unite to form gluten. Gluten has the power of absorbing nearly three times its weight of water and forming a tough, sticky, elastic mass. When carbon dioxide is produced in dough, it seeks to escape, but is retained by the expansion of the elastic gluten, thus causing the dough to rise.

Wheat is known as spring wheat and winter wheat. The spring wheat is planted in the spring and ripens or matures in the late summer. It is grown mainly in the northwestern parts of the United States and in the Canadian Northwest. The flour made from spring wheat is the best for bread making and for all forms of yeast mixtures.

Winter wheat is planted in the fall and it ripens in the early summer. It is grown in the sections of the country where the winters are less severe than in the Northwest, — in Ohio, Michigan, Indiana, etc., and in more southern latitudes. It is a softer wheat than spring wheat and makes a whiter flour, which is used for cakes, pastry, etc.

NOTE. — (*a*) Plant wheat in wet cotton, keeping it moist until the wheat plant grows. Note changes from time to time in the appearance of the wheat. Student write description of the sprouting of the wheat grain, using any standard botany for reference.

(*b*) Examine a section of wheat under the microscope, noting bran coats, aleurone layer, endosperm, and embryo. Stain a section of the wheat with iodine, which will turn the starch purple and the protein yellow. Make drawing of a section of wheat. Why has nature stored so many food principles in this little grain of wheat?

(*c*) Examine winter wheat and spring wheat flour, whole wheat flour, graham flour. Sift and examine the residue, if any, in the sieve. Compare color, texture, cohesion (press in hand).

To determine the composition of wheat flour.

EXPERIMENT 64. — Make a small amount of flour into a stiff dough. Put into a piece of fine cheesecloth and knead in a bowl of cold water until only a sticky mass is left in the cloth. Collect this. Note its physical properties. Work with the fingers for some minutes. Does the gluten become more elastic with kneading? Give one reason for kneading bread dough. Form part of the gluten into a ball and bake. What is the effect of heat upon it?

EXPERIMENT 65. — Test some of the gluten from the above experiment to see if it is protein? starch? sugar? See identification test for protein, page 69; for starch, page 21; for sugar, page 44.

EXPERIMENT 66. — Boil some of the water in which the flour from experiment 64 was washed. Cool and test for starch.

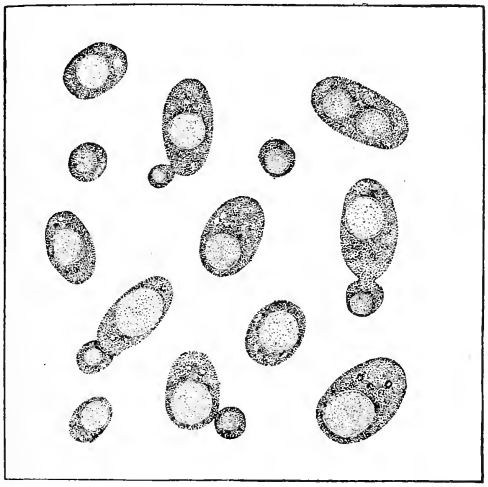
EXPERIMENT 67. — Let starch settle to bottom of the bowl in cup. Remove some of the clear top liquid and test for sugar.

EXPERIMENT 68. — (To be performed by the teacher.) Mix a little dry flour with ether, chloroform, or benzine. Filter, letting the filtrate drop on clean glass. Let the liquid evaporate. What is left on the glass?

CAUTION. — The fumes of chloroform, ether, and benzine are *very inflammable*. Do not use with fire or light burning in the room.

EXPERIMENT 69. — Burn a little flour in a porcelain crucible for several hours, or until only a white ash is left. What part of the flour is this?

Yeast. — (Review plant classification, page 50.)



Yeast Plant (magnified), showing method of reproduction.

Yeast is a single-celled plant that grows by budding, and requires sugar, some protein, and mineral matter for its nourishment. It is found floating in the air and settles on substances rich in sugar, where it grows and causes a chemical change in the substance upon which it is feeding, called fermentation. This is the change which takes place when

grape juice is changed to wine, when cider becomes " hard," or when " salt rising " bread is made.

Yeast is obtained in a pure form for commercial purposes from distilleries or breweries. The top yeast which floats on the surface of the fermenting liquid, or wort, is skimmed off and its impurities removed. It is then mixed with some starch, pressed, cut into cakes, wrapped in tin foil, and sold as " compressed " yeast. When mixed with corn meal and dried, it is sold as " dry yeast." The yeast cells of dry yeast are not as active as those of compressed yeast and take longer to raise bread.

Fermentation is a chemical change in an organic substance, caused by the growth within that substance of some ferment, as yeast. There are different varieties of ferments, each of which causes a different form of fermentation to take place.

Alcoholic fermentation is caused by the growing of the yeast plant, which feeds upon sugar, changing it to alcohol and carbon dioxide. This is the fermentation that takes place in bread making.

Acetic fermentation is caused by a ferment which changes the alcohol formed during alcoholic fermentation into acetic acid.

It occurs when alcoholic fermentation is allowed to go on for too great a length of time, or when the mixture is raised to a temperature above 90° F., as when hard cider turns to vinegar or bread dough sours.

Lactic fermentation is the change that takes place when milk sours. The lactic bacillus feeds upon the sugar of the milk and changes it to lactic acid ; this acid causes the casein to coagulate and the milk is " sour."

When milk is used for bread dough, it should be scalded to destroy the lactic bacilli, thus preventing souring of the milk during the rising, which might cause sour bread.

Chemical reactions in bread making:

starch		water	dextrose or sugar
$C_6H_{10}O_5$	+ a ferment +	H_2O =	$C_6H_{12}O_6$

Alcoholic fermentation:

		alcohol	carbon dioxide
$C_6H_{12}O_6$	+ yeast =	$2\ C_2H_5OH$	$+ 2\ CO_2$

Acetic fermentation:

alcohol	oxygen		acetic acid	water
$2\ C_2H_5OH$	$+ 4\ O$ + a ferment	=	$2\ CH_3COOH$	$+ 2\ H_2O$

Experiments with yeast.

Experiment 70. — Mix a small amount of yeast with water.

(*a*) Put a drop on a glass slide, cover with a glass, and examine under the microscope, first with a low power and then with a high power. Make a drawing.

(*b*) Stain the slide with a little iodine and examine again. What color do the yeast cells become when they are stained with iodine? The starch cells? What kind of starch was used in the yeast cake?

Experiment 71. — Make a solution of glucose and water, or molasses and water. Add some yeast. Let stand an hour or two in a warm place. Examine a drop under the microscope. How does the yeast cell reproduce?

Experiment 72. — Make a solution of glucose and water. Add some yeast. Put equal amounts in three test tubes.

(*a*) Boil the contents of one tube.

(*b*) Put one tube in a cold place or on ice.

(*c*) Keep one tube at temperature of 80° F. At the end of an hour or two, examine the contents of the tubes, noting any fermentation that may have occurred. Draw conclusions as to the best temperature for the growing of the yeast plant.

Warm (*b*) to a temperature of 80° F. and let stand for an hour or two. Does cold destroy the life of the yeast? Does boiling destroy it?

EXPERIMENT 73. — Put a solution of glucose, water, and yeast in a flask. Keep it warm until it ferments. Pass the gas through limewater. What change occurs in the limewater? What gas is given off during alcoholic fermentation?

Proportion of ingredients in bread making.

To every quart of wetting (milk and water) use:

1 cake yeast dissolved in $\frac{3}{4}$ c. lukewarm water,
or 1 c. liquid yeast.
2 ts. salt.
2 tb. or more of sugar.

In white bread use just enough sugar to replace the sugar of the flour lost during alcoholic fermentation; in other breads use sugar as desired for a flavor.

Two tb. shortening (lard or butter).

The amount of shortening may be increased for rolls or when a rich fancy dough is desired. For simple breads shortening may be omitted entirely.

Flour to form a soft dough.

If spring wheat flour is used, a smaller quantity will be required than would be needed of winter wheat. From two and a half to three times as much flour as liquid should be used, which includes the flour used on the board in kneading. With dark-colored flour, use about one-third white flour and the remainder dark flour. Doughs made with graham or entire wheat flour, which contain a large amount of gluten, are not made stiff enough to knead, but are well beaten with a spoon before being put to rise.

Kneading. — Bread is kneaded twice, the first time to incorporate the ingredients thoroughly, thus insuring an even texture, and also to make the gluten elastic so as to retain the carbon dioxide formed during fermentation. It should be kneaded until smooth and elastic, and until little

blisters may be seen on the surface of the dough. After the bread has risen until it is about double in size, it is kneaded again, but very lightly, the object being to break the large bubbles of CO_2 present, in order that the loaf may be fine-grained and to form the dough into the desired shape without losing its lightness. It is then placed in the pan to rise until light enough to bake.

Baking of Bread. — Bread is baked

(1) To kill the yeast plant.
(2) To hydrolize the starch granules.
(3) To soften the cellulose.
(4) To drive off the alcohol, CO_2, and excess of moisture.
(5) To dextrinize the starch, thus forming a crust of sweet, agreeable flavor.

All bread should be thoroughly baked. If there is any doubt as to its being done, let it continue baking, as long baking makes it wholesome. The oven should be hot enough to turn a piece of paper a light brown in five minutes. After placing the loaf in the oven, increase the heat gradually for ten minutes, then decrease slowly until the end of the baking. The oven should turn a piece of paper a dark brown in five minutes when rolls are to be baked.

Raw Potato Yeast

¼ c. flour	1 to 2 qts. boiling water
¼ c. sugar	1 cake compressed yeast
1 tb. salt	or 1 c. liquid yeast
3 raw potatoes	

Pare potatoes and keep in cold water. Mix flour, sugar, and salt in a large bowl, and grate the potato in as quickly as possible. Mix at once with wooden spoon. Pour the boiling water directly from the teakettle, stirring constantly and adding enough water to make the mixture the consistency of thin starch. If it does

not thicken, bring the mixture to the boiling point. Strain, and let cool. When lukewarm add yeast; if compressed, dissolve in 1 c. water. Keep mixture in warm (not hot) place till light. Beat well several times. At the end of 24 hours, put in earthen or glass jars, cover tightly, and put in a cool place. This will keep two weeks. Save the last cupful to start fresh yeast.

White Bread

1 pt. milk	2 tb. sugar
2 tb. lard	2 ts. salt

Put into a bowl and pour on them 1 pt. boiling water. When lukewarm, add 1 cake yeast dissolved in $\frac{3}{4}$ c. lukewarm water, or 1 c. liquid yeast. Add flour to make a soft dough. Knead on a floured board. Put into a greased bowl to rise, greasing the top of the dough to prevent a crust forming. Cover closely and let rise until it doubles in size, keeping the dough at a temperature of from 80° to 85° F. Knead again and shape into loaves. Let rise in the pan from $\frac{1}{2}$ to $\frac{3}{4}$ hours. It should not quite double in size. Bake 50 or 60 minutes, or until the loaf is a rich brown and emits a hollow sound when tapped on the bottom. Brush the loaf with milk. Let stand exposed to the air on all sides to allow the steam to escape. Put it into a freshly scalded bread jar, cover, but do not wrap in a cloth.

Parker House Rolls

1 pt. milk scalded	2 tb. sugar
2 tb. butter	1 ts. salt

When lukewarm, add $\frac{1}{2}$ cake yeast dissolved in $\frac{1}{2}$ c. water. Add flour to make a batter. Beat well. Add 1 beaten egg, and flour to make a dough. Knead and let rise till light. Shape into rolls, handling the dough as little as possible. Let rise in the pan about 1 hour or until very light. Bake in a quick oven 20 minutes. Brush with milk or butter. The egg may be omitted.

Rolls may also be made from bread dough. They take their name from the different forms in which they are shaped.

Entire Wheat Bread

1 pt. milk scalded
1 ts. salt
¼ c. sugar
or ⅓ c. molasses

When lukewarm, add ½ cake yeast dissolved in ½ c. water. Add 4⅔ c. entire wheat flour or enough to make a soft dough. Beat well, cover, and let rise until it doubles in size. Beat down and pour into greased bread pans. Let rise till light and bake 1 hour in a moderate oven. It should not quite double in bulk during the last rising.

Graham Bread

1 pt. milk scalded
4 tb. sugar
1 ts. salt
½ cake yeast dissolved in ½ c. water
2 c. white flour
3 to 3½ c. sifted Graham flour

Mix in the order given into a dough a little softer than for white bread. Beat well, let rise till light or till it doubles in size. Stir down. Pour into greased pans, let rise ¾ hour, and bake a little longer and in a more moderate oven than for white bread. Whole wheat may be used in place of Graham flour.

Rye Bread

1 pt. scalded milk
2 tb. butter
2 tb. sugar
1 ts. salt
½ cake compressed yeast dissolved in ½ c. water
2 c. white flour
Rye flour till stiff enough to knead

Mix in the order given, knead, let rise till light, and double in size, knead lightly, shape into loaves. Let rise in the pan till light, bake in a moderate oven for 1 hour.

Oatmeal Bread

2 c. oatmeal
3 c. boiling water
1 tb. lard
1½ ts. salt
¼ c. sugar
1 cake compressed yeast dissolved in 1 c. water
Flour to make dough

Scald oatmeal with boiling water, add lard, sugar, and salt, and when lukewarm the dissolved yeast. Add flour to make a dough stiff enough so that the spoon will stand upright in it. Beat well as the flour is added. Let rise 2 to 3 hours or until it doubles in size. Beat down, put into greased bread pans, let rise about ½ hour or until light. Bake 1 hour in a moderate oven.

To Ascertain the Cost of Bread:

Price of pastry flour (winter wheat) . . . . . .
Price of bread flour (spring wheat) . . . . . .
Price of bread flour per pound . . . . . .
Number of pounds required to make recipe for white bread
Cost of other ingredients . . . . . .
Total cost . . . . . .
Number of loaves made . . . . . .
Cost per loaf . . . . . .
Weight of loaf . . . . . .
Cost per loaf of baker's bread . . . . . .
Weight of loaf of baker's bread . . . . . .

CHAPTER XV

FATS — FRYING, AND PASTRY

Sources of fat.

1. Adipose tissue of animals, as beef fat, suet, etc.
2. Bone marrow.
3. Milk. Fat globules are held in suspension in the milk serum. (See Milk, page 108.)
4. Some vegetables. Some vegetables contain a small amount of fat, but they do not form an important source of fat in the diet.
5. Some fruits and seeds. The olive is an important source of fat, furnishing olive oil. The seed of the cotton plant furnishes an important commercial oil, cottonseed oil.
6. Nuts. Nuts contain a large amount of fat. The oil of peanuts and cocoanuts furnish important commercial forms of oil.

Fats are composed of carbon, hydrogen, and oxygen. They contain a larger amount of carbon and hydrogen than do carbohydrates, hence have a greater fuel value.

	Carbon	Hydrogen	Oxygen
Carbohydrates	44.4 %	6.2 %	49.4 %
Fats	76.5 %	11.9 %	11.5 %

One pound of fat yields approximately two and one fourth times as much heat and energy as one pound of carbohydrates, hence forms a valuable food in cold climates.

Fats are composed of fatty acids and glycerine. Among the fatty acids are:

1. Stearic acid of stearin.
2. Palmatic acid of palmatin.
3. Oleic acid of olein.

One or more of these acids are found in all fats in combination with glycerine. The fatty acid which predominates gives the characteristic to the fat.

Fats may be split up into fatty acids and glycerine by

(1) Being heated in very hot steam.

stearin glycerine stearic acid

$$(C_{17}H_{35}O_2)_3C_3H_5 + 3H_2O = C_3H_5(OH)_3 + 3C_{17}H_{35}COOH$$

(2) Bacterial action, as when fats become rancid.

(3) Action of fat-splitting enzymes of the digestive fluids.

(4) Action of strong alkalies, as in soap making.

(5) Action of high temperature, as in frying.

Fats are insoluble in water, but are soluble in ether, chloroform, gasoline, etc. To remove grease spots from clothing, moisten the spot with any of the above solvents and rub lightly until dry. The solvent will dissolve the grease and thus free the dust which may have adhered to it. This cleaning process should always be carried on in the open air and away from any flame, as the fumes of gasoline, etc., are very inflammable when mixed with air and ignite easily, often causing serious accidents.

Emulsion. — When fat is divided into minute globules which are held in suspension in a liquid, it is said to be in emulsion. This is a physical state and is readily broken down. The most perfect example of an emulsion is the suspension of the fat globules in fresh milk. The emulsion is but temporary and the fat rises to the surface in the form of cream.

Saponification. — When fat is heated with a strong alkali, it is split up into fatty acid and glycerine, the alkali uniting with the acid and forming a soap, and the glycerine being set free. This reaction is called saponification and may be expressed by the following formula:

		sodium		sodium	
palmatin	+	hydrate	=	palmitate	+ glycerine
$C_3H_5(C_{16}H_{31}O_2)_3$	+	$3NaOH$	=	$3NaC_{16}H_{31}O_2$	+ $C_3H_5(OH)_3$

The soap is soluble in water. This reaction is made use of in household cleaning when a strong alkali as soda, lye, borax, etc., is added to "cut the grease."

An excellent soap may be made in the household from fats left in cooking combined with a strong alkali, such as concentrated lye. All fats or drippings left from cooking should, therefore, be saved for soap making. Full directions for making soap are given with the lye purchased for soap making.

FRYING

Frying is cooking by immersion in hot fat at a temperature of from 350° to 400° F. Lard, olive oil, beef suet, beef drippings, or some commercial forms of fat may be used. The fat should be so hot that it will instantly coagulate the albumen on the outside of the article, forming a coating to keep the fat from soaking in. All articles which do not contain egg in sufficient quantity must be rolled in fat-proof coating. Lard boils at 585° F., so for cooking purposes fat does not boil. The ebullition which takes place is due to water in the article fried being converted into steam. Too many articles should not be placed in the fat at one time, as they will cool the fat. The articles should not be too cold, as that will also cool the fat. All fried food should be perfectly drained by holding over the kettle of fat and

shaking gently, and then laid on brown paper. Raw potato absorbs the unpleasant odors or gases of fat, and collects some of the sediment, so a few slices should be put in both before and after frying. After using fat, allow it to cool slightly, then pour it through a cheesecloth put over a strainer. It may thus be used several times. When several articles are to be fried, fry them in the following order: potatoes, batter mixtures, breaded articles, fish.

Objections to Frying as a Method of Cooking.

1. Articles may be grease-soaked.

2. High temperature necessary for frying splits fat up into fatty acid and glycerine. Fatty acid is irritating to organs of digestion. Glycerine is farther split up by heat into acrolein, which gives the disagreeable odor to hot fat and which is also very irritating to the mucous membranes of the digestive organs.

Burning Point. — The higher the burning point of a fat, the more valuable is the fat for frying purposes, as it will retain a greater amount of heat before it carbonizes. Butter has a low burning point, hence carbonizes easily and is a poor fat to use for frying.

Experiment 74. — Take temperature of fat when it begins to heat with a laboratory thermometer that will register 450° F. Note temperature of fat when it bubbles. What is the cause of the bubbling? Heat until it stops bubbling and begins to smoke. Note temperature. Drop in a slice of potato. What causes the bubbling in the fat? What is the temperature of fat when it is hot enough for frying? Note odor of acrolein.

Experiment 75. — Heat in separate pans small amounts of butter, lard, cottolene, and other commercial fats. Which burns most easily? Which has the highest burning point?

Cost of Fat for Frying. — When making doughnuts put a definite weight of lard and any fats used locally for frying, in kettles of the same size. Fry an equal number of dough-

nuts in each. Weigh the lard and the other fats which are left after frying, computing the amount and cost of the fats used. Estimate the cost of frying a dozen doughnuts in each kind of fat.

Rule for testing fat. — When the fat begins to smoke, drop in an inch cube of bread from the soft part of the loaf. If it browns in forty seconds the temperature is right for frying any cooked mixture, as croquettes; if it browns in sixty seconds it is right for uncooked mixtures, as doughnuts.

Fried Potatoes

Wash and pare potatoes. Slice thinly on a vegetable slicer into a bowl of ice water. Let stand an hour, drain, and dry between towels. Fry in hot fat, stirring while frying to make them brown evenly. When a light brown put into a colander. Sprinkle lightly with salt.

French Fried Potatoes

Select small potatoes of uniform size. Wash, pare, and cut into eighths lengthwise. Soak 1 hour in cold water. Dry well and fry in hot fat until the center of the potato is cooked. Drain well in a colander or on brown paper. Sprinkle with salt, and serve.

Doughnuts

Yolks of 4 eggs or 2 whole eggs
1 c. sugar
3 tb. melted butter
½ c. milk and ½ c. water
4 ts. baking powder
½ ts. salt
½ ts. each cinnamon and nutmeg
Flour to make a dough just stiff enough to handle, about 4 c.

To the beaten eggs add sugar and butter. Beat well, add water and milk, then 2 c. flour sifted with the baking powder, salt, and spices. Add more flour till of the right consistency. Toss one third of the mixture on a floured board. Knead lightly. Roll to ½ inch or more in thickness. Cut with a doughnut cutter and fry in deep fat. Drain well.

Doughnuts should come quickly to the top of the fat, brown slightly on one side, then be turned to brown on the other. If the fat is not hot enough, they will absorb fat; if too hot, they will brown before sufficiently risen. When they are slightly cool, put them in a paper bag, one at a time, with 3 or 4 tb. powdered sugar, and shake gently to coat them with sugar.

Crullers

¼ c. butter
1 c. sugar
2 eggs, beaten separately
1 c. milk
4 c. flour, or enough to make dough
4 ts. baking powder
¼ ts. nutmeg
Powdered sugar and cinnamon

Cream the butter, add sugar gradually, beaten yolks and beaten whites. Mix dry ingredients, add alternately with the milk. Put on floured board, roll thin, and cut in pieces two by three inches. Cut 3 or 4 parallel incisions, run finger in and out of them, and drop into deep fat. Fry the same as doughnuts, and roll in powdered sugar and cinnamon.

Potato Croquettes

1 pt. hot mashed potatoes
2 tb. butter
½ ts. salt
Cayenne and black pepper to taste
½ ts. celery salt
½ tb. grated onion
1 tb. minced parsley
Yolks of 1 or 2 eggs

Mix all but the egg and beat till very light. When slightly cool add beaten egg. Shape into balls. Roll in fat-proof coating and fry in deep fat. Drain on brown paper. Serve hot.

Veal Croquettes

Chop cold veal fine. Season highly with salt, celery salt, cayenne, lemon juice and parsley. Moisten 1½ c. of the veal with 1 c. thick cream sauce. (Page 24.) Spread out the mixture on a

plate and allow it to become perfectly cold. Shape into cylinders, or pear shaped mounds, roll in fat-proof coating, and fry in deep fat. Drain and serve hot.

Chicken, salmon, lobster, sweetbread, or any meat croquettes are prepared in same manner.

Fat-proof Coating

Roll the article to be fried in fine sifted bread crumbs, then dip in egg slightly beaten with 1 tb. water, roll again in crumbs. If not perfectly coated the article may crack in frying.

To prepare Crumbs

Dry pieces of bread in the oven without browning, roll or put them through the meat chopper and sift. Put into fruit jars to be ready for use.

Bread crumbs make a richer brown than cracker crumbs.

Fritter Batter

1 c. flour	Whites of 2 eggs
¼ ts. salt	Yolks of 2 eggs
½ c. milk or water	1 tb. melted butter or olive oil

Mix salt and flour. Add milk gradually, yolks of eggs beaten until thick, butter, and beaten whites of the eggs. If intended for fruit, add 1 ts. sugar; if for oysters or tripe, add 1 tb. lemon juice.

Banana Fritters

4 bananas	Powdered sugar
	1 tb. lemon juice

Remove skins from bananas, cut in halves lengthwise and then across. Sprinkle with sugar and lemon and let stand. Dip in fritter batter, fry in deep fat, drain, and serve hot with lemon sauce.

Fried Fish

Clean and dry the fish, and bone it. Rub with salt and pepper. Cut into pieces suitable for serving, roll in fat-proof coating and fry in deep fat 5 to 7 m. Drain and serve with tomato, tartar, or any acid sauce.

Cheese Croquettes

Whites of 3 eggs	1 ssp. mustard
1 c. grated cheese	Speck of cayenne

Beat the whites very stiff, stir in the cheese and seasoning. Let stand in a cold place till stiff enough to mold. Make into small balls the size of a hickory nut and fry in hot fat. Serve with salad.

PASTRY

While the materials which are used in making pastry are wholesome and nutritious, they are combined in a form which makes them somewhat difficult to digest, so pastry should be used sparingly in the diet.

The requisites for good pastry are that it shall be tender, flaky, and light. The first quality will depend upon the amount and the kind of fat used, upon the manner in which the pastry is handled in mixing and rolling, and upon the amount of water used in making the dough. If but little water is used, the gliadin and glutinin of the flour do not unite to form as tough a gluten, and the pastry is more tender. It was noted in bread making that working the dough made the gluten elastic, and as this is not desired in pastry making, the dough should be handled as little and as lightly as possible.

The flaky quality of the pastry will depend upon the number of layers of flour and fat that are formed in the dough by the methods of rolling and folding. The shortening used should be very cold and firm, so that it will not soften and mix with the flour. All pastry is improved if the dough is placed in a napkin and put near the ice for some time before being rolled into shape for baking.

The lightness of the pastry will depend upon the amount of air incorporated in the dough in folding, and its expan-

sion in baking. A small amount of baking powder is sometimes added to the flour before making it into dough.

Winter wheat flour should be used, as it contains less gluten than spring wheat flour and makes a more tender crust.

Shortening for Pastry

1. *Butter.* This makes a crisp, brown, somewhat hard crust. It is used in making puff paste and may be mixed with other fats for ordinary pastry.
2. *Lard.* This makes a soft, white, and tender crust.
3. *Beef suet.* When properly tried out, this is a good and an inexpensive form of fat.
4. Many commercial forms of fat mixtures may be used.

To render fat. — Cut beef suet or leaf fat from pork into small pieces. Soak in cold salted water for several hours. Drain off water and heat fat slowly until the fat separates out and the connective tissue browns slightly. Drain through a cheese cloth placed over a colander. Press to remove all fat.

NOTE TO STUDENT. — Why is the fat soaked in salted water? Weigh fat and estimate cost per pound. Compare cost with current market price of lard.

AMOUNT OF SHORTENING FOR PASTRY

	Flour	*Shortening*
Puff Paste	2 c.	1 c. butter
Pastry	2 c.	$\frac{2}{3}$ c. shortening
Plain Pastry	2 c.	$\frac{1}{2}$ c. shortening

Use $\frac{1}{2}$ ts. salt to 2 c. flour.

$\frac{1}{4}$ ts. baking powder may be added to flour.

$1\frac{1}{2}$ c. flour makes one large pie with a double crust.

Pastry

$1\frac{1}{2}$ c. flour	$\frac{1}{2}$ ts. salt
$\frac{1}{2}$ c. shortening	Ice water to make stiff dough

Sift the salt with the flour, add one half the shortening, and with a knife cut it into pieces about the size of a pea. Add the ice water gradually, lifting with a knife that portion which was moistened first and put it on a floured board, or push to one side of the bowl. Wet another portion, and so continue until all is moistened, using just enough water to hold it together. Dredge the dough on the board with flour, roll lightly from you into a long strip. Put the remainder of the shortening cut in small pieces over the top of the strip, sprinkle lightly with flour and fold it up toward the center. Roll again into a long strip and roll this up like a jelly roll. Cut from the roll enough paste for a crust, roll to fit the pan, place on the ungreased pie tin, fulling it slightly as pastry shrinks in baking. Trim the edges with a knife as far over the outside edge of the pan as possible. Put in the filling, rounding it a little in the center.

Roll the upper crust. While it is still on the board, make perforations to let the steam escape during the baking. Lay the upper crust on the pie by lifting it on the rolling pin, fold back one half, wet the edge of the lower crust, put the upper half back on it. Trim the upper crust, pressing the edges lightly together.

Pies baked without an upper crust should have a double rim. Roll paste into long pieces, and cut strips about one inch and a quarter wide; fit neatly on the rim of under crust before filling the pie. Perforated tins may be used for baking pies, thus insuring a well-baked under crust. Pastry should be thoroughly cooked and well browned. Pies require from thirty to forty-five minutes for baking. Do not grease the tin. When slightly cool, slip the pie on to an earthen plate.

Apple Pie

4 or 5 sour apples	1 ts. lemon juice
$\frac{3}{4}$ c. sugar	$\frac{1}{8}$ ts. salt
$\frac{1}{4}$ ts. nutmeg	$\frac{1}{2}$ ts. butter

Line a pie plate with paste. Pare and slice apples. Put a row around the plate one half inch from the edge, fill the center of the plate, then pile on the remaining apples. Mix sugar, salt, nutmeg and lemon juice and sprinkle on the apples. Dot with butter and sprinkle with flour. Add a little water. Put on the upper crust, bake 40 to 45 m. in a moderate oven.

Evaporated apples may be soaked overnight and used in place of fresh ones.

Pumpkin Pie

1¼ c. steamed and strained pumpkin	¼ ts. each cinnamon, ginger, nutmeg
½ c. sugar	1 egg
½ ts. salt	⅞ c. milk

Add sugar, salt, spice to pumpkin; add the milk, scalded, and when cool, the egg slightly beaten.

Pour into a crust with a double rim. Bake in a quick oven at first to set rim; decrease the heat afterward, as milk and egg in combination must be cooked at a low temperature.

If richer pie is desired, use 1 c. pumpkin, ½ c. milk, ½ c. cream, and an additional egg yolk.

Custard Pie

2 eggs	⅛ ts. salt
¼ c. sugar	1½ c. milk

Nutmeg

Beat egg slightly, add sugar, salt, and milk. Strain into a pie plate lined with crust with a double rim. Bake in a quick oven at first to set the rim; decrease the heat afterward, as the custard will separate if cooked too quickly. When a knife inserted into the custard comes out clean, the pie is baked.

Do not allow the custard to boil during the baking.

Mince Meat

1 chopped apple
½ c. raisins, seeded and chopped
½ c. currants
¼ c. butter or suet
1 tb. molasses
1 tb. boiled cider
1 c. sugar
1 ts. cinnamon
½ ts. cloves
½ grated nutmeg
¼ ts. mace
1 ts. salt

Add enough stock in which the meat was cooked to moisten; heat gradually and simmer 10 m. Then add 1 c. chopped meat, 1 tb. currant jelly. Cook 15 m.

Lemon Pie

⅞ c. sugar
1 c. water
3 tb. corn starch
Yolks of 2 eggs
Grated rind and juice of one lemon
1 ts. butter

Mix corn starch and sugar, add boiling water, stirring constantly; cook 2 m., add butter, beaten yolks, and lemon. Pour into a pan lined with a crust with a double rim. Bake till pastry is brown. Cool slightly and cover with a meringue.

Meringue

Whites of 2 eggs
4 tb. powdered sugar
A few drops of lemon juice or vanilla

Beat the whites till stiff, add sugar gradually, continue beating, add flavoring, and spread on the pie. Bake in a slow oven 10 to 12 m. If cooked quickly and too long, meringue is tough.

Cranberry Pie

Line a pie dish with paste and fill with uncooked cranberries. Add ½ c. molasses, 4 tb. sugar. Cover with an upper crust and bake in a quick oven 30 m.

Cranberry Tart

Line a pan with paste, fill with stewed and sweetened cranberries. Lay strips of crust over the top, log cabin fashion, and bake.

Tarts

Roll paste $\frac{3}{16}$ inch thick. Cut with a biscuit cutter. Cut as many more pieces with a doughnut cutter. Brush the circles with water and lay the rims on them. Chill thoroughly and bake 15 m. in a hot oven. Cool and fill with jelly. By placing 3 or 4 rings on the tart, shells may be made for creamed oysters or chicken.

Cheese Straws

Roll paste $\frac{1}{4}$ inch thick. Sprinkle one half with grated cheese to which has been added a few grains of salt and cayenne. Fold, press edges together, fold again, roll out $\frac{1}{4}$ inch thick. Sprinkle with cheese and proceed as before; repeat twice. Cut in strips 5 inches long, $\frac{1}{4}$ inch wide; dust with salt. Bake 8 m. in hot oven.

CHAPTER XVI

CAKES AND PUDDINGS

Cakes may be classified under two heads:

1. Cakes without butter, or sponge cakes.
2. Cakes with butter.

Powdered sugar makes a fine-grained cake. Coarse granulated sugar makes a coarse-grained, sticky cake. Winter wheat flour should be used, as it makes a light, tender cake.

To mix Sponge Cake. — Separate the yolks from the whites. Beat the yolks till lemon-colored and thick. Add the sugar gradually and continue beating. Add flavoring. Fold in the whites beaten stiff. Sift in the flour carefully, and do not beat after adding the flour, or the air bubbles will be broken and the cake will be close grained and tough.

Do not grease the pan for sponge cakes. Line the bottom of the pan with ungreased paper cut to fit it.

To mix Butter Cakes. — Use an earthen bowl and a wooden spoon. Have all the ingredients measured and ready, the pans greased before beginning to mix the cake. Cream the butter, add the sugar gradually, and beat till very light. Add the beaten yolks, flavoring, then the milk, and flour in which the baking powder has been sifted, alternately. Beat well, as cake is made fine-grained only by long beating; then fold in the beaten whites. Never stir the cake after the final beating.

For butter cakes, grease the pan with lard (do not use butter, as it burns), sprinkle with flour, shake out all the

flour that does not adhere to the grease. Fill the pans about two thirds full, having the mixture come well into the corners. Leave a slight depression in the middle, so that the cakes will be level when baked.

Baking. — The baking is the most critical part of cake making. Test the oven with a piece of white paper. If it turns a light yellow in 5 minutes, it is ready for sponge cakes; if a dark yellow in 5 minutes, it is ready for butter cakes.

The time of baking should be divided into quarters; during the first quarter the mixture should begin to rise; during the second quarter it should continue to rise and begin to brown; in the third quarter, continue browning; in the last quarter, finish baking and shrink from the edge of the pan. Cake should not be moved until it has risen its full height. When it feels firm to the touch, shrinks from the pan, stops crackling, and a straw inserted comes out clean, the cake is done. Small and layer cakes require a hotter oven than sponge and loaf cakes.

Sponge cakes are of two general kinds:

1. Those in which the eggs and sugar are the only liquids used.
2. Those in which water is added for part of the liquid.

Sponge cake is nutritious and is easily digested. It is the best form of cake to give to children.

NOTE. — Estimate the cost of a sponge cake made without water, and a sponge cake made with water, and compare with the cost of butter cakes. Compute the relative cost of sponge and butter cakes at different seasons of the year.

Sponge Cake (without water)

5 eggs
1 c. fine granulated sugar
$\frac{1}{2}$ lemon (grated rind and juice)
1 c. flour
$\frac{1}{8}$ ts. salt

Mix as in directions for sponge cake. The mixture should be stiff and spongy. Bake in a loaf in a deep pan nearly 1 hour, in a shallow pan about 40 minutes.

Berwick Sponge Cake (with water)

Yolks 3 eggs	2 c. flour
$1\frac{1}{3}$ c. sugar	2 ts. baking powder
$\frac{1}{2}$ c. water	Whites 3 eggs

$\frac{1}{2}$ ts. lemon extract, or grated rind and juice $\frac{1}{2}$ lemon

Beat the yolks 5 minutes, add sugar and beat 3 minutes, then the water, lemon, flour and baking powder, and last fold in the beaten whites. Bake in a loaf.

Washington Pie

Bake Berwick Sponge cake in round, shallow tins. When cool, split and fill with cream. Sprinkle top with powdered sugar.

Cream Filling for Washington Pie. — Scald 1 pt. milk. Mix 5 tb. flour, $\frac{1}{2}$ c. sugar with a little cold milk. Stir into scalding milk. Cook 5 m. Add 1 beaten egg, $\frac{1}{8}$ ts. salt. Cook till thick. When cool, flavor with $\frac{1}{2}$ ts. vanilla.

Angel Food

Whites of 11 eggs, 1 c. flour measured after one sifting, then sifted four times, $1\frac{1}{2}$ c. fine granulated sugar sifted three times. Beat the whites till stiff, on a platter with 1 ts. cream of tartar, add the sugar gradually, and 1 ts. vanilla or almond. Sift in the flour quickly and lightly. Pour into an ungreased pan and bake in a slow oven 45 or 50 minutes. Invert the pan till slightly cool.

NOTE. — Estimate the cost of an angel food with eggs at various prices. Compare with cost of butter cakes.

Soft Molasses Cookies

1 c. molasses	$\frac{1}{2}$ c. butter or lard softened
$1\frac{3}{4}$ ts. soda	1 ts. ginger
1 ts. salt	1 ts. mixed spice
1 c. sour milk	Flour

Add soda to molasses and beat well, add milk, shortening, spice, salt and flour enough to roll. Put on a floured board and roll $\frac{1}{4}$ inch thick. Cut and bake.

Sponge Drops

4 eggs
$\frac{1}{2}$ c. powdered sugar
1 ts. flavoring
$\frac{3}{4}$ c. pastry flour
$\frac{1}{2}$ ssp. salt

Mix as for sponge cake. Drop by spoonfuls on an ungreased pan, sprinkle with powdered sugar and bake 12 to 16 minutes in a slow oven.

Cookies

$\frac{1}{2}$ c. butter
1 c. sugar
1 or 2 eggs
$\frac{1}{4}$ c. milk
$\frac{1}{4}$ ts. nutmeg
4 ts. baking powder
$2\frac{1}{2}$ c. flour, or enough to roll out thin

Mix in the order given, following directions for mixing cup cakes. Roll out, cut, sprinkle the top with sugar. Bake about 10 m.

Sour Cream Cookies

$\frac{1}{2}$ c. butter
$1\frac{1}{2}$ c. sugar
2 eggs
$\frac{1}{2}$ c. sour cream
1 ts. soda
Flour to roll

Mix as above.

Hermits

$\frac{1}{3}$ c. butter
$\frac{2}{3}$ c. sugar
1 egg
4 tb. milk
2 c. flour
$\frac{1}{3}$ c. raisins stoned and chopped
$\frac{1}{2}$ ts. cinnamon
$\frac{1}{4}$ ts. cloves
$\frac{1}{4}$ ts. mace
$\frac{1}{4}$ ts. nutmeg
2 ts. baking powder

Cream butter, add sugar gradually, raisins, beaten egg and milk. Mix and sift the dry ingredients and add. Roll a little thicker than plain cookies. Cut and bake.

Jumbles

½ lb. butter
½ lb. powdered sugar
2 eggs
¾ lb. flour
Nutmeg

Save out 3 tb. of the sugar to roll them in. Cream the butter, add sugar, beaten eggs, flour and nutmeg. Roll, cut with a doughnut cutter, and bake a light brown.

Sand Tarts

½ lb. butter
1 lb. brown sugar
3 eggs
1 lb. flour

Cream the butter, add the sugar, beaten eggs, leaving out the white of one, and the flour. Roll thin, cut into 3-inch squares. Brush with the white of an egg and sprinkle with granulated sugar and cinnamon. Put an almond or raisin in the center of each and bake in a quick oven.

Ginger Snaps

1 c. molasses
½ c. shortening
1 tb. ginger
½ ts. soda
1 ts. salt
3¼ c. flour

Heat the molasses to boiling point and pour over the shortening. Add dry ingredients mixed and sifted. Chill thoroughly. Roll as thin as possible, cut and bake. Keep the dough cool or you will have to add more flour, which will make the cookies hard.

Place cookies far enough apart on the baking pans so that they will not run together. Roll only a part of the dough at a time, gather up the trimmings, and add to the dough. Knead lightly till mixed.

Soft Ginger Cookies

⅔ c. shortening (butter and lard)
1 c. sugar
1 c. molasses
½ c. hot water, in which dissolve 1½ ts. soda
1 ts. each cinnamon, ginger, and salt
½ ts. cloves
Flour to make a soft dough

Mix in order given; roll and bake.

NOTE. — Estimate the cost per dozen of the various small cake and cookies.

NOTE. — Student study recipes of butter cakes as obtained from various cook books and family recipes and tabulate them as to the proportions of ingredients used. Also estimate cost. Arrange the proportions on the basis of 3 c. flour used in the cake.

NAME AND SOURCE OF RECIPE

BUTTER	SUGAR
MILK	EGGS
FLOUR	BAKING POWDER

TOTAL COST OF RECIPE

One Egg Cake

$\frac{3}{8}$ c. butter creamed	1 c. milk
1 c. sugar	$2\frac{1}{4}$ c. flour
1 egg beaten light	$3\frac{1}{2}$ ts. baking powder
	$\frac{1}{2}$ ts. vanilla

Mix in the order given, following directions for butter cake. Bake in a shallow pan in a moderate oven for 20 to 30 minutes.

White Cake

$\frac{1}{2}$ c. butter	3 c. flour
$1\frac{1}{2}$ c. sugar	4 ts. baking powder
1 c. water	Whites 4 eggs
	1 ts. flavoring

Follow directions for mixing butter cakes.

Park Street Cake

$\frac{1}{2}$ c. butter	4 eggs
$1\frac{1}{2}$ c. sugar	4 ts. baking powder
1 c. milk	1 ts. flavoring
3 c. flour	1 ssp. mace

Cream the butter, add 1 c. sugar. Add the remaining cup of sugar to the beaten yolks, beat well together and proceed as in directions for butter cakes. Bake in 2 loaves in a moderate oven, or in layers.

Spice Cake

½ c. butter	2 eggs
½ c. sugar	2¼ c. flour
½ c. raisins seeded and cut in pieces	3 ts. baking powder
½ c. molasses	½ ts. salt
⅜ c. boiled coffee	½ ts. cinnamon
¼ ts. nutmeg grated	½ ts. allspice

Follow directions for mixing butter cakes. Bake in a loaf in a moderate oven, or in layers.

Devil's Food

Part 1.	½ c. butter	½ c. sweet milk
	1 c. brown sugar	1 ts. soda
	1 whole egg and 2 yolks	2⅛ c. flour

Mix as any cake.

Part 2.	3 squares chocolate	½ c. sweet milk
	1 c. brown sugar	

Heat over hot water till smooth; add to Part 1 with ½ ts. vanilla. Bake in two layers and frost with white frosting.

Plain Frosting

White of 1 egg	½ ts. vanilla or
2 ts. cold water	½ tb. lemon juice

¾ c. confectioner's sugar

Beat egg stiff. Add water and sugar and beat well. Add flavoring and more sugar if needed. Spread with a broad knife.

Boiled Frosting

1 c. granulated sugar	⅓ c. water

⅛ ts. cream of tartar

Mix together, and boil, without stirring, until the syrup will thread when dropped from a fork. Pour gradually on the beaten white of 1 egg, beating constantly, and continue beating until thick enough to spread. Flavor with ½ ts. vanilla. If not beaten long enough it will run when spreading; if beaten too long it will not spread smoothly. In the latter case a few drops of boiling water may be added.

One square of melted chocolate may be added when the syrup is poured on the egg.

Sugar for frosting is boiled to thread stage or soft ball, and at this stage the sugar thermometer registers 238° F.

Marshmallow Frosting

1 c. granulated sugar ⅓ c. water

Boil together without stirring till of the consistency of honey; then dip 3 tb. of it and pour on the beaten white of 1 egg. Boil rest of syrup until it threads, then pour slowly on the egg. Add 6 or 8 marshmallows which have been heated over hot water till soft. Flavor and beat till thick enough to spread.

Beaten Frosting

To the unbeaten whites of 2 eggs add 3 times their measure in bulk of XXXX confectioners' sugar. Beat until stiff enough to spread on the cake. Flavor to taste. This frosting thickens from the beating and will require beating from 20 to 30 minutes. It may then be used for ornamental decoration on a cake.

Chocolate Frosting

2 squares of Baker's chocolate
¼ c. milk
½ ts. vanilla
1 c. powdered sugar
Yolk of an egg

Melt the chocolate in the double boiler, add ½ the sugar and the milk; add the remaining sugar and the beaten yolk. Cook till it thickens, stirring constantly at first. Cool slightly, flavor, and spread.

PUDDINGS

Puddings are more wholesome than pastry and should be more frequently served. They may be divided into three general classes — boiled, baked, and steamed puddings.

Cottage Pudding

2 heaping c. flour
3½ ts. baking powder
½ ts. salt
1 egg
¾ c. sugar
3 tb. melted butter
1 c. milk

Mix the salt and baking powder with the flour. Add the sugar, butter, and milk to the beaten egg and stir into the flour. Bake in a shallow pan in a quick oven from 20 to 25 m. Serve hot with sauce.

Rice Pudding

½ c. rice
½ c. sugar
½ ts. salt
1 qt. milk

Wash rice, mix ingredients, pour into a pudding dish. Bake from 2 to 3 h. in a very slow oven at first, then let it brown slightly. Serve hot or cold.

Bread Pudding

3 c. stale bread crumbs soaked 1 h. in 1 qt. milk. Add to 2 beaten eggs, ½ c. sugar, ½ ts. salt, ¼ ts. spice and 2 tb. softened butter. Stir into the milk. Bake 1 h. in a slow oven. Remove from oven, spread with jelly or jam, and cover with a meringue made of the beaten whites of 2 eggs and 4 tb. powdered sugar. Bake in a slow oven 10 m. until a delicate brown.

Grated rind and juice of ½ lemon may be added to the pudding.

Scalloped Apples

Put a layer of bread crumbs in a baking dish, then a layer of sliced apple, sprinkle with sugar and cinnamon and grated lemon rind, dot with bits of butter. Repeat layers, having crumbs on

top with bits of butter to make them brown. Moisten with water. Bake 40 m. in moderate oven. Cover at first to prevent crumbs from browning too rapidly. Serve with sugar and cream.

Indian Pudding

5 c. scalded milk
$\frac{1}{3}$ c. Indian meal
$\frac{1}{2}$ c. molasses
1 ts. salt
$\frac{1}{2}$ ts. ginger, if liked

Pour the milk slowly on meal, cook in double boiler 20 m. Add molasses, salt, and ginger. Pour into a buttered pudding dish and bake 2 hours in a very slow oven. Serve with cream. If baked too rapidly it will separate. This may be cooked successfully in a fireless cooker.

Suet Pudding

$2\frac{1}{2}$ c. flour
1 ts. soda
$\frac{1}{2}$ ts. salt
1 ts. cinnamon
$\frac{1}{2}$ ts. nutmeg
1 c. chopped suet, or $\frac{1}{2}$ c. butter
1 c. raisins or currants, chopped
1 c. water or milk
1 c. molasses

Sift salt, soda, spice with flour, rub in the suet and add raisins. Mix milk with molasses and stir it into the dry mixture. Steam in a buttered pudding mold 3 h. Serve with sauce.

Graham Pudding

$\frac{1}{4}$ c. butter
$\frac{1}{2}$ c. molasses
$\frac{1}{2}$ c. milk
1 egg
$1\frac{1}{2}$ c. graham flour
$\frac{1}{2}$ ts. soda
1 c. raisins seeded and cut in pieces
1 ts. salt

Melt butter, add milk, molasses, well beaten egg, the dry ingredients mixed and sifted, and raisins; put into buttered mold, cover, and steam $2\frac{1}{2}$ hours. Serve with sauce.

Prune Whip

Wash ½ lb. prunes. Soak. Cook in a little water till soft. Remove stones and rub through a colander. Add ¾ c. sugar. Beat the whites of 4 eggs stiff. Add the prunes, a spoonful at a time. Bake in a slow oven till a light brown, about 20 m. Serve with whipped cream sweetened and flavored with vanilla, or with soft custard.

Tapioca Cream

2 tb. pearl tapioca
1 pt. milk
⅓ c. sugar
2 eggs beaten separately
⅛ ts. salt
½ ts. vanilla

Soak tapioca in hot water to cover for 1 h. or more; add the milk and cook in a double boiler till the tapioca is transparent. To beaten yolks add sugar and salt. Pour the hot mixture over them, return to double boiler, and cook 2 or 3 m. Remove from fire, add beaten whites. When cool, flavor.

Sponge Pudding

1 tb. butter
½ c. flour
¼ c. sugar
½ ts. baking powder
3 eggs beaten separately
1 pt. milk

Mix the sugar and flour, wet in a little cold milk and stir into a pint of boiling milk. Cook till thick and smooth, add butter and beaten yolks. When cool add baking powder and fold in beaten whites. Bake in a pudding dish set in a pan of hot water 25 to 30 m. Serve with creamy sauce.

Caramel Custard

4 c. scalded milk
3 or 4 eggs
1 ts. vanilla
½ c. sugar
1 ssp. salt

Put sugar in an omelet-pan and stir over the fire until it forms a light brown syrup. Add slowly to the milk. Cook in a double

boiler till the sugar dissolves, pour slowly over the slightly beaten eggs. Flavor. Strain into a buttered pudding dish. Set in a pan of hot water and bake till a knife inserted will come out clean. Egg and milk in combination must be cooked at a low temperature or they will separate.

Add more sugar before baking if not sweet enough.

Lemon Sauce

See page 127.

Vanilla Sauce

1 c. sugar	1 or 2 tb. butter
1 c. water	1 egg

Boil water and sugar together 5 m. Add butter, and when melted pour over the egg well beaten. Stir over the fire till it thickens slightly. Add $\frac{1}{2}$ ts. vanilla. If egg is cooked too long, it will separate.

Foamy Sauce

$\frac{3}{8}$ c. butter	1 egg
1 c. powdered sugar	$\frac{1}{2}$ ts. vanilla

Cream butter, add sugar gradually, the well-beaten egg and vanilla; beat while heating over hot water till smooth, but do not melt the butter.

Creamy Sauce

$\frac{1}{4}$ c. butter	4 tb. cream
$\frac{3}{4}$ c. powdered sugar	1 ts. vanilla

Cream the butter. Add sugar gradually and the cream, drop by drop. Set over hot water and beat till smooth and creamy, but do not melt the butter. Flavor.

Yellow Sauce

Beat 1 egg until very thick. Add gradually $\frac{3}{4}$ c. powdered sugar and beat well with a silver fork. Add 1 tb. melted butter. Beat over hot water for about 10 m. Add $\frac{1}{3}$ ts. vanilla. Serve hot.

CHAPTER XVII

MINERAL FOODS — SALADS

Use of mineral matter in body:

1. Form bone.
2. Essential part of protoplasm.
3. Necessary for body fluids, etc.

An average man excretes between twenty and thirty grams of mineral matter per day. This amount must be supplied to the body by food and beverages. The only mineral matter which is added directly to our food is common salt, sodium chloride (NaCl), all the others required being found in sufficient quantity in a well-balanced dietary. We probably consume much more common salt than is needed by the body, but it has a decided value as a condiment, improving the flavor of foods and hence making them digest more easily. Mineral matter, as a rule, is found abundantly in fresh fruits and vegetables.

Two of the most important minerals required by the body are lime (calcium, Ca) and iron (Fe). The other minerals are also of much importance, but are usually supplied by our foods in sufficient quantity for the needs of the body.

Lime. — Three fourths of the mineral matter of the body is calcium phosphate, which is found in the bones, soft tissues, and in solution in the body fluids. Blood will not clot without lime salts, and they are necessary for the beating of the heart.

Both organic and inorganic forms of lime may be assimilated by the body, even those which are insoluble in water. Animals that eat bones probably assimilate some of the lime; however, organic lime has greater food value than inorganic lime.

A child must have a sufficient quantity of lime in its food or the bones will not grow properly, and general development of the body will be arrested.

Milk is very rich in lime. Lime water is added to milk in infant feeding, not to increase the amount of lime, but to soften the casein curd so that it may digest more easily. Milk is richer in lime than lime water.

Foods Rich in Lime	*Foods Poor in Lime*
Milk	Meats
Egg yolk	Fish
Peas, beans, turnips, oranges, carrots, parsnips, spinach	Bread
	Polished rice
Most cereals	New process corn meal

Iron. — Iron is found in the body chiefly in the red coloring or hemoglobin of the blood. In this form it acts as an oxygen carrier, carrying oxygen from the lungs to all parts of the body. A deficiency of iron in the diet brings on anemia and other diseases of deficient oxidation. Chlorophyll grains in plants cannot be produced without iron. If plants are grown in solutions free from iron, the leaves are colorless, but become green when iron salts are added.

Iron is found as a constituent part of protein. Milk contains less iron than any other food, as the young animal is born with about three times more iron than is needed for its immediate use. Children kept too long on a milk diet become anemic.

The iron in cereals lies in and near the outer coats or bran. Entire wheat flour is thus much richer in iron than is fine white flour. The human body readily assimilates organic iron or that found in plant foods and meats, but the value of medicinal iron tonics is doubtful, as inorganic iron does not assimilate readily, if at all. The iron in eggs and vegetables is probably assimilated to better advantage than that in meats. Herbivorous animals are less liable to anemia than are carnivorous animals.

IRON IN TYPICAL FOOD MATERIALS (H. C. SHERMAN)

Food	Amount of Iron in 100 Grams Fresh Substance
Beefsteak, all lean	3.85 mm.
Beefsteak, medium fat	2.2
Eggs	3.0
Milk, whole	0.24
Milk, skimmed	0.25
Cream (18.5% fat)	0.20
Cornmeal	1.15
Oatmeal	3.7
Rice, polished	0.7
Wheat flour	1.5
Wheat entire grain	5.2
Beans, lima, dried	7.2
Beans, navy, dried	6.7
Beans, string, fresh	1.6
Cabbage	0.9
Corn, sweet	0.8
Peas, dried	5.6
Potatoes	1.2
Spinach	3.8
Turnips	0.6
Apples	0.3
Prunes	2.9
Raisins	3.6

SALADS

Salads are mixtures of fish, fruits, vegetables or meats, with a salad green and some form of salad dressing. The food value of salad greens is not high, as they are composed largely of water, but they form a valuable part of the diet, because of their richness in mineral salts.

A salad is more or less nutritious according to the ingredients used in it. The butter, oil, cream or eggs used in salad dressing give it a high heat and energy value. During the spring and summer months a salad of fresh green vegetables should appear upon the table every day. All salads should be served cold and crisp and the dressing should be added just before serving.

The salad served with a dinner of several courses should be made of vegetables or fruits and be mixed with a French dressing. When the salad forms a main dish of a luncheon or supper, it may be made of various combinations of meats, vegetables, etc., mixed with a mayonnaise, a cooked, or a cream dressing.

Meat for salad should be freed from skin, gristle, and fat and be cut into small cubes. Fish should be freed from bones and skin, and the flesh flaked. Vegetables, as a rule, should be cut into quarter inch cubes.

Lettuce. — Lettuce should be carefully washed to remove any dirt and bacteria which may cling to it and also small green insects which are sometimes found on the under side of the leaves. Wash each leaf separately, changing the water often. Shake the leaf gently to remove water, then place on a clean towel and dry carefully with another towel until perfectly dry, but not wilted.

To freshen lettuce. — Place in a bowl of ice water to which has been added 1 tb. vinegar and let stand $\frac{1}{2}$ hour.

To keep lettuce. — After washing, put lettuce in a pail, stem end down, cover closely and set in a cold place.

To mix salad. — Put alternate layers of salad ingredients and dressing in a bowl. Lift from the bottom with a fork and spoon and toss lightly until well mixed.

To marinate a salad. — Cut materials for a salad into cubes and pour over them a French dressing. Let stand an hour. Drain; mix salad with any desired dressing as usual.

MATERIALS THAT MAY BE USED IN SALAD

Meats	*Fruits*	*Greens and Garnishes*
Chicken	Oranges	Lettuce
Veal	Grapefruit	Celery
Roast pork	Pineapple	Endive
Sweetbreads	Bananas	Chickery
Calves' brains	Malaga grapes	Water cress
Fish	Cherries	Romaine
Salmon	Apples	Escarole
Lobster	Dates	Radishes
Shrimp	*Miscellaneous*	Pimentos
Sardines	Eggs	Sweet peppers
Oysters	Nuts	Olives
White fish	Cheeses	Parsley
	Marshmallows (with fruit)	

Vegetables

Potatoes	Beets
Cabbage (raw)	Green peas
Spinach	Cucumbers (raw)
Tomatoes (raw)	Carrots
String beans	Asparagus

Salad dressings are of many varieties, but may be classed under the following heads:

1. Cooked salad dressing.
2. Mayonnaise.
3. French dressing.
4. Cream dressing.

All dressings, with the exception of French dressing, should be just thick enough to coat the particles of food with which they are mixed; if too thin they will settle in the bottom of the dish; if too thick, they will not mix well. They should be thinned with either sweet or sour cream to the right consistency just before serving. Dressings are seasoned with salt, cayenne, and paprika, but mustard should be used sparingly, if at all. A small amount of sugar may be added for fruit salads, but a dressing for a fish or meat salad should not be sweetened.

Cooked Salad Dressing

Yolks 4 eggs or 2 whole eggs beaten until very light. Add 2 tb. vinegar and 2 tb. milk or cream. Set the bowl in a saucepan of hot water and cook, stirring continuously until the mixture is of the consistency of soft butter. Do not let the water boil around it, as the high temperature hardens the albumen on the sides of the bowl and tends to make the dressing lumpy. Remove from fire and add 3 or 4 tb. butter, 1 ts. salt, and few grains of cayenne. When ready to use, thin with cream.

Mayonnaise

Put yolks of 1 or 2 eggs on a plate and rub smooth with a silver fork. Add olive oil, drop by drop, stirring till well mixed. When it thickens, add a few drops of vinegar to thin; repeat process till required amount is made. Season. Lemon juice may be used in place of vinegar.

If the dressing separates in mixing, add the mixture, drop by drop, to another yolk of egg. If the dressing is to be made in quantity, put the yolks of egg in a bowl and beat in the oil with a Dover egg beater. Use yolks of 2 eggs for ½ pt. oil. When ready to use, thin with whipped cream.

French Dressing

¼ ts. salt	3 tb. olive oil
⅛ ts. pepper	1 tb. vinegar

Add oil to the salt and pepper; stir till seasoning is dissolved; add vinegar and stir till well mixed.

Whipped Cream Dressing

½ c. whipping cream	⅜ ts. salt
1 tb. vinegar	Few grains cayenne or
1 tb. lemon juice	paprika

Beat cream until thick; add the other ingredients slowly. Use at once.

Dressed Lettuce

Wash and dry lettuce. Serve with French dressing to which Roquefort cheese has been added, if desired; or garnish with balls made of cream cheese. Any of the salad dressings may be served with lettuce.

Potato Salad

Cut cold potatoes into one-fourth inch cubes, sprinkle lightly with salt and, if liked, marinate with French dressing. Add chopped onion, celery, cucumbers cut in cubes, chopped parsley, pimento, etc., to taste. Mix with salad dressing; garnish with radishes, shredded lettuce, hard-boiled eggs, etc.

The dressing for potato salad should be rather thin, as the potato absorbs it.

Cabbage Salad

Cut the cabbage in halves, slice very thin; let soak ½ hour in ice water. Drain well, mix with a salad dressing. Serve at once.

Egg Salad

Cook eggs twenty minutes in water just below the boiling point. Put in cold water. Remove shells and cut eggs in any desired shape. Put on lettuce leaves. Add a spoonful of salad dressing. Garnish.

Fish Salad

Prepare fish. Add an equal amount of celery cut in small pieces. Mix with a salad dressing and place on lettuce leaves. Serve at once.

Chicken or Any Meat Salad

Cut chicken or meat in $\frac{1}{3}$-inch cubes. Add an equal amount of celery cut in small pieces. Marinate if desired. Mix with salad dressing and put on lettuce leaves or shredded lettuce. Serve at once.

Sandwiches. — The bread for sandwiches should have a fine, even texture and should be twenty-four hours old. The loaf should be of a size to cut the sandwiches with as little waste as possible. All crusts trimmed from the bread should be saved for bread crumbs. If a large number of sandwiches is to be made, remove all crust from loaf and trim it into shape before slicing. Very thin slices of buttered bread may be prepared by softening the butter and spreading on the loaf before slicing. Sandwiches may be kept fresh for several hours by wrapping them in slightly dampened napkins. If for a lunch box, each sandwich should be wrapped in paraffin paper. The lunch box should be lined with paraffin paper and be divided into compartments with pieces of cardboard to hold the different kinds of food.

Lettuce Sandwiches

Prepare bread for sandwiches. Spread with salad dressing and lay shredded lettuce (which has been washed carefully and dried) between the slices.

Egg Sandwiches

Chop hard-boiled eggs fine and mix with salad dressing. Spread between thin slices of bread.

Cheese Sandwiches

Mix cream cheese with mayonnaise and spread between slices of bread. Chopped pimentos, olives, nuts, etc., may be added.

Cheese Filling

2 tb. butter
3 tb. corn starch
1 c. milk
¼ ts. salt
Speck cayenne

Make as a white sauce. Cook 10 minutes. Add 1 beaten egg, 1 c. grated cheese. Cook till cheese is melted. Cool. Spread in center of finger rolls and heat rolls in oven just before serving. Or spread mixture on rounds of bread, and heat in oven till cheese is melted.

Ham Sandwiches

Mince ham fine. Season with cayenne and mustard. Moisten with cream or melted butter and spread between slices of bread.

Cheese Wafers

Sprinkle wafers with grated cheese mixed with a little mustard and cayenne. Bake till the cheese melts.

CHAPTER XVIII

GELATINE AND FROZEN DESSERTS

Gelatine is a protein and is classed as an albuminoid. It is derived from the collagen of connective tissue, cartilage, and bone, which is converted into gelatine by boiling with water. Unlike albumen and globulin, gelatine is soluble in hot water and forms a jelly when cold.

Although classed as a true protein, gelatine cannot sustain life, if it is the only form of protein supplied to the body. When gelatine is added to the diet, however, a smaller amount of other forms of protein is required to maintain a protein equilibrium in the body.

Commercial gelatine is extracted from the tendons and sinews of calves' feet and from the bones, tendons, and clippings of skin of older animals. It is sold in the form of sheets, or is shredded, granulated, or powdered, and put in boxes. A box of gelatine usually contains two ounces and will stiffen two quarts of jelly. More gelatine should be used when fruits are molded in the jelly. Uncooked pineapple should not be added to jelly, as it contains an enzyme which will liquefy the gelatine; cooking destroys the enzyme.

Gelatine should be first soaked in cold water until soft, using 1 c. water to 2 oz. gelatine, and then be dissolved in a boiling liquid and allowed to stand without disturbing until it jellies.

Lemon Jelly

1 oz. gelatine ($\frac{1}{2}$ box)
$\frac{1}{2}$ c. cold water
$\frac{1}{2}$ c. lemon juice
$2\frac{1}{2}$ c. boiling water
1 c. sugar

Soak gelatine in cold water till soft; add the sugar, lemon juice, and the boiling water; stir until gelatine is dissolved. Strain through a cheesecloth wrung out of hot water. Put in mold wet in cold water and set in a cold place till firm.

To Unmold Jelly. Set the mold in a pan of lukewarm water, having the water come as high as the jelly. Do not let the jelly melt. Place the dish in which the jelly is to be served over the mold and invert them both. Shake gently until the jelly drops from the mold.

Gelatine has a very low melting point, so the water should not be hot, nor the mold left in it too long.

Jellied Prunes

$\frac{1}{3}$ lb. prunes
$\frac{1}{4}$ box gelatine soaked in $\frac{1}{4}$ c. cold water
1 c. sugar
$\frac{1}{4}$ c. lemon juice

Wash prunes and soak for several hours in 2 c. cold water, cook in same water till soft; remove prunes, stone, and cut in quarters. To prune water add enough boiling water to make 2 c. Add soaked gelatine to boiling mixture, also the sugar and lemon juice, strain, add prunes, and pour into mold. Let harden. Stir twice while cooling to prevent prunes from settling. Serve with sweetened cream. Dried apricots or peaches may be used in the same way.

Apple Compôte

See page 49.

Neapolitan Pudding

Soak ½ box gelatine in 1 c. cold water, dissolve in 1 pt. boiling water, add ½ c. sugar, the juice of 1 lemon and 1 orange, and strain into 1 pt. preserved strawberries. Pour off part of the clear juice and let it begin to stiffen, then add the beaten whites of 2 eggs and beat like snow pudding. Put the rest of the mixture into a mold and pour the beaten mixture on top. Let stand till hard. Serve with whipped cream.

Snow Pudding

½ box gelatine
1 c. cold water
1 pt. boiling water
1½ c. sugar
Juice of 3 lemons
Whites of 3 eggs

Soak the gelatine in cold water, add the sugar and lemon juice, and pour over them the boiling water. Stir till gelatine and sugar are dissolved. Strain. Set in a pan of ice water. When the mixture begins to stiffen, beat till smooth, and add the beaten whites. Beat till white and foamy all through like a drop batter. Pour into a mold wet in cold water. Let stand several hours. Serve with soft custard.

Soft Custard

1 pt. milk
Yolks 3 eggs
⅓ c. sugar
½ ssp. salt
½ ts. vanilla

Scald the milk and pour it slowly over the beaten yolks and sugar. Return to double boiler and cook 2 or 3 m. or till it coats the spoon. When cool, flavor. If it separates, set in cold water and beat till smooth with a Dover egg beater.

Bavarian Cream

1 c. milk
2 yolks of eggs
½ c. sugar
Pinch of salt

Cook as a soft custard in a double boiler. While hot, add ¼ c. gelatine which has been soaked in ½ c. cold water. Stir until

gelatine is dissolved. Strain through a wire sieve. Let stand until the mixture begins to stiffen, then beat it smooth, add 1 ts. vanilla and 1 c. cream beaten stiff. Stir slowly until well mixed. Pour into mold wet in cold water. Let stand until firm. Various flavorings may be added.

Spanish Cream

Make as Bavarian Cream, adding the 2 beaten whites of eggs in place of the whipped cream.

Charlotte Russe

¼ box gelatine	1 ts. vanilla
¼ c. cold water	Lady fingers or
¼ c. boiling water	sponge cake
½ c. powdered sugar	1 pt. cream

Soak the gelatine in cold water. Chill the cream and whip it, skimming off the froth into a bowl set in ice water. Sift the sugar over the whipped cream and flavor. Dissolve the gelatine in the boiling water and let stand until cool, but do not let it stiffen; strain over the cream. Stir slowly till the mixture is nearly a drop batter. If it feels lumpy, remove from ice water and stir till smooth. Pour into a mold lined with lady fingers. Keep on ice till ready to serve.

Freezing. — The freezing point of water is 32° F. or 0° C. The freezing point of a mixture of salt, ice, and water is lower than that of water. When salt and ice are placed in the space between the wooden tub of an ice cream freezer and the metal can, their freezing point being lower than that of the ice alone, the ice melts and draws the heat (latent heat) from the cream in the inner can, thus causing the cream to freeze. The larger the quantity of salt used, the more quickly the mixture will freeze, but too rapid freezing makes a coarse-grained ice cream. The mixture will freeze more rapidly if the ice is chopped fine.

Experiment 76. — Make a mixture of 1 part salt to 3 parts ice. Make a mixture of 1 part salt to 2 parts ice. Take temperature. Place a test tube containing water in each of the above mixtures; note time required to freeze the water.

ICES AND SHERBETS

Ices and Sherbets are prepared from various fruit juices, crushed fruits, or other flavorings which are dissolved in water. The frozen mixture will have a smoother texture if the sugar used is cooked to a syrup with part of the liquid before adding to the fruit. A white, creamy sherbet may be made by adding the beaten whites of 1 or 2 eggs to the partly frozen mixture. A mixture will lose sweetness and flavor when frozen and should be made a little sweeter and be more highly flavored than desired, before freezing.

Suggestions for sherbets:

Lemon	Strawberry
Orange	Raspberry
Pineapple	Juice of cooked cranberries
Grape juice	Mint steeped in water
Bananas	Apricots
Oranges and lemons	Peach

Fruits should be mashed or grated, or only the juice used. If large pieces of fruit are to be used, add when the mixture is nearly frozen.

How to freeze Ice Cream and Ices. — Crush ice fine by putting it in a burlap bag and pounding with a wooden mallet or hatchet. Put the mixture to be frozen in the can, put into the wooden tub and adjust the top, making sure it fits perfectly. Put in the ice, allowing three measures of ice to one of rock salt. Pound down with a small board. Repeat till ice comes nearly to the top of the can.

The mixture increases in bulk during freezing, so the can should be only three fourths full. Turn the crank slowly and steadily at first, more rapidly toward the last. Never draw off the salt water till the mixture is frozen. When freezing is accomplished, remove dasher and with spoon pack solidly. Draw off the water, repack freezer, using four parts of ice to one of salt. Cover freezer and let stand from one to three hours to ripen.

Pineapple Ice

1 pt grated or chopped. pineapple
Whites of 2 eggs
1 pt. sugar
3 c. water

Boil water and sugar 10 m. Cool, add pineapple. Freeze according to directions. When frozen to a mush, add the beaten whites and finish freezing. Juice and grated rind of 1 or 2 lemons may be added to mixture before freezing.

Lemon Ice

1 qt. water
2 c. sugar
Grated rind of 2 lemons
$\frac{3}{4}$ c. lemon juice
Whites of 2 eggs

Boil the water and sugar 10 m. Add lemon rind and juice. Cool and strain. Freeze. When nearly stiff, add the beaten whites and finish freezing.

ICE CREAM

Ice cream may be prepared from:

1. Pure cream.
2. Cream plus milk.
3. Soft custard plus cream.
4. Soft custard.

Any desired flavoring may be added.

The sugar used should be heated till dissolved with part of the liquid. If part of the cream is whipped, it will improve the texture. The custard may be thickened with corn starch, arrowroot, or flour and yolks of eggs, or with egg yolks alone. Cook corn starch 15 minutes.

Custard Foundation for Ice Cream

Thicken 2 c. milk scalded in double boiler, with 2 tb. flour wet in cold milk. Add 1 c. sugar, $\frac{1}{8}$ ts. salt. Cook 5 minutes, add beaten yolks 2 eggs, cook 1 minute, cool. When cool, add 3 c. cream and any desired flavor. Freeze.

Flavorings which may be added:

2 tb. vanilla.
2 sq. melted chocolate and 1 tb. vanilla.
Sweetened and crushed fruits.
Chopped candied fruits, 1 tb. vanilla.
Dried and pounded macaroons, 1 tb. vanilla, etc.

Cream Foundation for Ice Cream

1 qt. cream $\frac{3}{4}$ c. sugar

Scald sugar with 1 c. of the cream; cool, add remainder of cream and flavoring. Freeze.

Strawberry Ice Cream

To above rule, add 3 pts. berries rubbed through a colander and mixed with $1\frac{1}{4}$ c. sugar.

CHAPTER XIX

INVALID COOKERY

Liquid Diet

1. Milk.
2. Broths, beef tea.
3. Albumen drinks.
4. Eggnog.
5. Gruels.
6. Cream soups.
7. Beverages, etc.

Light or Soft Diet

1. Cream soups.
2. Soft-cooked eggs.
3. Milk toast.
4. Cereals.
5. Soft custards.
6. Junket.
7. Creamed sweetbreads.
8. Creamed chicken.
9. Light puddings.
10. Gelatine desserts, etc.

Convalescent Diet

1. Soups.
2. Broiled tender meats and fish.
3. Baked, creamed potatoes.
4. Some light vegetables.
5. Simple salads.
6. Cooked fruits.
7. Baked custards.
8. Light desserts.
9. Any simple easily digested foods.

Foods to Avoid for Invalids and Children

1. Pastry.
2. Rich cakes.
3. Veal.
4. Pork.
5. Sausage.
6. Lobster.
7. Any fried food.
8. Hot breads.
9. Baked beans.
10. Tea and coffee (for children).
11. Alcoholic beverages.

12. Any highly seasoned or stimulating food or beverage.
13. All foods difficult of digestion.

To set an Invalid's Tray. — The tray should be of a size to hold easily any dishes placed upon it. Cover it with a clean linen doily. In cases of contagious diseases paper doilies may be used in serving and afterwards be burned; and all dishes should be sterilized in boiling water. Arrange the tray in the same relative position as the cover in setting a table. Use the daintiest dishes to be obtained. Place a single blossom on the tray.

In serving children a slightly fantastic arrangement of foods which will appeal to the imagination will often be the means of causing children to take the necessary nourishment. Never serve large portions of food, or the sight of it may take away the appetite.

LIQUID DIET

Milk. — As milk forms a clot by the action of the enzyme, rennin, as soon as it reaches the stomach, it should be regarded as a solid food and not a beverage. When taken, it should be sipped slowly that the clots formed may be small and hence more easily digested. The digestibility of milk may be increased by the addition of limewater or a starch gruel. (See milk, page 108.)

Infants have no starch-digesting enzymes present in the saliva or pancreatic juice until they are about one year old, hence cannot digest starchy foods. Any starch given to them should be dextrinized with heat or by the action of the enzyme diastase present in malt. Starch gruels should be dextrinized by the addition of some commercial malt extract before being added to milk to be given to children under one year of age.

Milk for invalids may be clotted by the addition of rennin in the form of junket tablets. Bacteria grow very rapidly in milk, so care should be taken to obtain the purest milk possible. If there is the slightest doubt as to the purity of the supply, the milk should be sterilized or Pasteurized before it is used.

Sterilized Milk

Fill ½ pt. bottle with milk to within 1½ inches of the top; cork with sterile cotton. Stand in a steamer of cold water, having the water surround bottles to three-fourths their height. Heat water gradually until it nearly reaches the boiling point and keep at this temperature for ten minutes or longer. Remove from water and cool quickly.

If the milk is to be Pasteurized, raise the temperature of the water to 167° F. and keep at that point for twenty minutes.

Albumenized Milk

White of 1 egg — 1 c. milk

Place egg and milk in a covered glass jar. Shake till they are thoroughly blended. It may be sweetened and flavored. Serve immediately.

Junket

1 c. milk	⅛ ts. salt
2 tb. sugar	¼ junket tablet dissolved in 1 ts. water

Heat milk until lukewarm, 100° F., add sugar and salt, stir in the junket quickly. Pour into the dish in which it is to be served. Let stand in a warm place until set, then chill and serve with cream.

Meat Broths. — Broths may be made from beef, mutton, or chicken. As ordinarily made the food value of broths is very low, the albumen and globulin of the meat being coagu-

lated by heat and removed by straining, the extractives alone remaining in the broth. To prepare meat for broths wash it carefully with a wet cloth and remove all fat.

Beef Tea, No. 1

1 lb. beef from round — 1 pt. cold water
$\frac{1}{3}$ ts. salt

Prepare meat as given in directions for broths and cut in small cubes. Put in a fruit jar with the water and salt, and let stand $\frac{1}{2}$ hour. Place in a pan of cold water on a trivet, having the water in the pan as high as the contents of the jar. Heat gradually in the oven or on top of the stove, not letting the water become hotter than 180° F. Keep at this temperature for two hours, strain and season. In reheating care should be taken not to coagulate the juices.

Beef Tea, No. 2

Remove all fat from 1 lb. round steak. Chop meat fine. Add 1 pt. cold water and $\frac{1}{3}$ ts. salt, and let stand in ice box from 1 to 3 hours. Heat very gently, stirring all the time until it just changes color. Pour into wire strainer and press the meat. Season liquid with salt and reheat very carefully, not to coagulate the juices. Do not remove the brown flakes if they form.

Mutton Broth

2 lb. mutton or lamb cut from forequarter or leg
2 pts. water
1 tb. boiled rice
$\frac{3}{4}$ ts. salt

Prepare meat as for broths. Cut in small pieces. Add water and salt. Cook slowly until meat is tender and bones clean. Strain, cool, remove every particle of fat. Reheat and add boiled rice.

Gruels. — Gruels are a liquid preparation of some cereal and water or milk. They must be cooked thoroughly that the starch may be well hydrated, and then be strained to

remove any cellulose. Milk should be added just before serving and the gruel then be reheated. Flour, barley, and cracker gruels act as astringents.

Flour Gruel

2 c. milk — 2 tb. flour
$\frac{1}{4}$ ts. salt

Scald milk; thicken with flour wet in cold milk. Cook over hot water 30 minutes. Add salt. Serve.

Oatmeal Gruel

$\frac{1}{4}$ c. oatmeal — $\frac{1}{2}$ ts. salt
3 c. boiling water — Milk

Add oatmeal to boiling water and salt. Cook in double boiler 2 hours. Strain. Add milk or cream and reheat.

Cracker Gruel

2 butter crackers — 1 c. milk
$\frac{1}{8}$ ts. salt

Roll crackers and add to scalded milk. Cook 5 minutes in double boiler. Add salt and serve.

Albumen Drinks. — Add the white of egg, beaten only enough to break the fiber slightly, to any liquid, as milk, water, fruit juices, adding sugar to taste.

Eggnog

1 egg beaten separately — $\frac{2}{3}$ c. milk
1 tb. sugar — $\frac{1}{4}$ ts. vanilla or a little
Few grains salt — nutmeg

Add sugar, salt, milk, flavoring, to beaten yolk. Strain, add the beaten white. Stir well before serving.

Apple Water

1 large sour apple — 2 ts. sugar
1 c. boiling water — Lemon to taste

Wipe and core apple. Put sugar in center and bake till tender; mash. Pour on the water, let stand ½ hour, and strain. Add lemon juice. Used as a cooling drink for fever patients.

Lemonade

½ lemon	¾ glass water	2 tb. sugar

Add sugar and water to the lemon. Soda water, Apollinaris, or Seltzer water may be used.

All fruit drinks are improved if sweetened with syrup instead of sugar.

Syrup for Fruit Beverages

Boil 1 c. sugar and 1 c. water for 10 minutes. Cool, bottle, and use as desired.

Flaxseed Lemonade

2 tb. whole flaxseed	Lemon juice
1 pt. boiling water	Sugar

Pick over and wash flaxseed, add water, and cook one hour, keeping just below the boiling point. Strain, add lemon and sugar to taste. Add more water if too thick.

Good in kidney troubles and also soothing to the throat in bronchial affections.

LIGHT DIET

Toast. — Bread for toast should be at least 24 hours old. It is toasted to extract moisture, to dextrinize the starch, and to make it more palatable and digestible. The slices should be cut thin and toasted with a steady, even heat to evaporate the moisture and brown the slice without burning it. Serve at once.

Water Toast

Toast 2 slices of bread until very dry and a light brown. Have 1 pt. boiling water in a shallow pan, add 1 ts. salt. Dip the toast quickly into the water, remove to a hot dish, spread with butter, and serve very hot.

Milk Toast

Toast 2 slices of bread. Scald $\frac{3}{4}$ c. milk, add $\frac{3}{4}$ tb. butter, $\frac{1}{4}$ ts. salt, pour over the toast. Serve very hot.

Cream Toast

Thicken $\frac{3}{4}$ c. milk with 1 tb. flour wet in cold milk. Cook over hot water 20 minutes, add $\frac{1}{2}$ tb. butter and $\frac{1}{4}$ ts. salt. Pour over 2 or 3 slices of toast. Serve very hot.

Broiled Beef Cakes

Scrape round steak fine. Season with salt and pepper. Make into small flat cakes and broil over a clear fire; or heat a frying pan very hot, rub it over with butter, and cook the cakes two or three minutes, browning on both sides.

Lemon Cream

2 eggs 2 tb. sugar

Juice and grated rind of $\frac{1}{2}$ lemon

Beat the yolks very light, add sugar and lemon, and place the bowl in a dish of boiling water on the fire. Stir till the mixture begins to stiffen, then add the beaten whites and stir two minutes longer, or till the whole resembles very thick cream; remove from the fire and let cool. Serve in small glass dishes.

Orange Cream

Prepare as above, using orange juice in place of lemon.

For other recipes for Invalid Cookery see recipes under various headings.

CHAPTER XX

TABLE SERVICE

In setting the table, arrange all dishes with system; never place them carelessly upon the table. An asbestos covering may be placed on the table to prevent warm dishes from injuring its polish. Cover the table with a felt or covering of canton flannel, or even with an old but clean tablecloth; over this, place the tablecloth, having the creases straight. Put a centerpiece of linen on the tablecloth, and in the center of this place a vase of flowers or a small growing plant.

See that the vinegar and oil cruets, salt and pepper bottles are filled and wiped clean. Plan for all the dishes and silver that will be required during the meal, putting them in their proper places, thus avoiding confusion in serving.

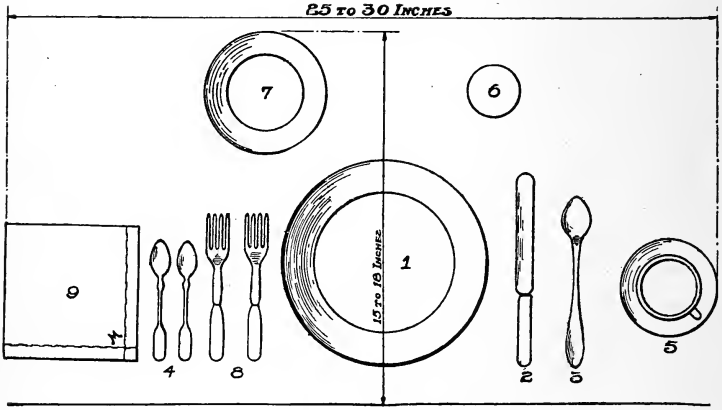
Lay a "service" plate for each person. Do not allow the "cover" (space in front of each person) to be without a plate until just before the dessert. At the right of the plate, place the knives, soup spoon, and oyster fork. Place the glass above the knives, a little to right. At the left of the plate, place the forks, small spoons, and napkin. Above the forks, place the bread and butter plate with a butter spreader lying across it. Place carving knife and fork and table spoons to the right of person who is to serve.

All dishes that are to be heated should be placed in a warming oven. On a side table, place all other dishes that will be needed during the meal.

For breakfast, arrange the coffeepot, sugar, creamer, cups, and saucers in a semicircle in front of the hostess, placing each cup in its saucer on the table at the left. The cereal dishes should be placed at the left of the one who is to serve the cereal.

TABLE SETTING

INDIVIDUAL COVER



1. "Service" or "place" plate.
2. Knife.
3. Soup spoon.
4. Tea spoons.
5. Cup and saucer (to be placed here during meal).
6. Tumbler.
7. Bread and butter plate.
8. Forks.
9. Napkin.

In serving, the waitress should keep in her hand a large folded napkin for handling all dishes, using a tray only for carrying small dishes. Put a linen doily on all trays and on dishes to hold all breadstuffs and cakes, and on the plates under the finger bowls.

When the meal is ready, put the butter on the table and fill the glasses with cold water. Announce the meal by saying, "Dinner (or whatever meal it is) is served."

Stand at the left of the person who is serving and take with the napkin each plate as it is served, carrying to the person for whom it is intended. If it is a soup plate, set it down upon the service plate. If it is the plate of the meat course, remove the service plate and set the other plate in its place. Set dishes down and remove them from the right of the person whom you are serving; pass to the left any dish from which they are to serve themselves, holding the dish low and firmly.

See that each person is kept supplied with bread, and that the glasses are filled. When each course is finished, remove the plates, one at a time, and then the platter, the large dishes, and all other dishes not needed for the following courses. Do not pile the dishes upon each other in removing them.

Before the dessert is served, brush the crumbs from the table using a crumb scraper, or brush the crumbs with a folded napkin to a plate. After the last course, remove the plates and place a finger bowl in front of each person. Set the finger bowl on a plate with a doily and fill one-third full of fresh water. Put a half slice of lemon in the bowl.

Do not let the table become disordered during a meal. Move quietly and be alert to anticipate every need of the guests.

When you are hostess, as well as cook and waitress, leave the table quietly when necessary, removing dishes and bringing others as needed. Special care must be taken that all is in readiness before sitting down at the table.

When the meal is over, set the chairs in place and brush up all crumbs from the floor before removing dishes. Remove table dishes to pantry or kitchen. Put away any food that remains, on dishes kept for that purpose. Scrape all dishes well, using a scraper with a rubber edge, or a crust

of bread. Pile dishes neatly in place, putting those of a size together.

Brush crumbs from tablecloth, fold in its creases, and put away. Put the dining room in order before washing the dishes.

Wash the dishes with hot soapy water, rinse with hot water, and wipe with dry towels until perfectly dry. Put the dishes on a tray and carry to their proper places.

Breakfast is usually a simple meal and is served in a manner to suit the needs of the individual family, but if a course breakfast is desired, serve it in the following order:

1. Fruit.
2. Cereal with cream or top milk.
3. Simple meat or egg dish.
   Rolls, toast, etc.
   Coffee or some beverage.
4. Griddle cakes or waffles and syrup.

NOTE. — Students make list of dishes that may be served for breakfast or "breakfast possibilities." Write breakfast menus for different seasons of the year, estimating cost. Cook and serve a breakfast.

Order of Courses for a Formal Dinner. — 1. Canapés.
2. Raw oysters or clams, served on the half shell on crushed ice with lemon and grated horseradish. Wafers.
3. Soup. Crackers, croutons, or toast sticks.
4. Fish. Potatoes (boiled, mashed, or fried). Sliced cucumbers. Brown bread.
5. Meat Course. Roast, two vegetables, rolls or bread, jelly, pickles, etc.
6. Frozen water ice.
7. Salad. Crackers, or toasted cheese rounds, cheese balls, etc.

8. Dessert.
9. Crackers and cheese.
10. Coffee.

Order of Courses for a Family Dinner.

1. Soup.
2. Meat, etc.
3. Salad.
4. Dessert.

A formal dinner is not often served in the ordinary household, but if a dinner of fewer courses is served, they are arranged in the same relative order as in a formal dinner.

NOTE. — Students write list of "dinner possibilities," arranging them under "soup," "fish," etc. Write dinner menus for family dinners for different seasons of the year, estimating cost. Cook and serve a dinner.

Luncheon. — A luncheon menu is similar to a dinner menu, with the exception that a fruit is often served first, and a lighter meat dish is served in place of a roast.

For a family luncheon or supper some one hot nutritious dish is served with a light salad, fruit, etc.

NOTE. — Each class is to serve in turn a breakfast, luncheon, and dinner, planning menus and estimating cost.

CHAPTER XXI

DIET AND NUTRITION

The amount of food required by an individual will necessarily vary with the age, occupation, and temperament of the individual, and the climate in which he lives. However, by many series of experiments and studies of diets, certain definite standards of the amount of food needed under various conditions have been established and form a guide which may be profitably followed. The total food requirement for a given time is spoken of as a dietary.

The food must furnish the requisite amount of heat and energy needed by the body under various conditions, and also furnish material for growth of new cells and repair for those that are constantly breaking down.

Heat and Energy Requirement. — Foods which contain carbon and hydrogen in a form in which they can be oxidized by the body yield heat and other forms of energy to the body. The fuel value of a food is estimated by the amount of heat it will give when oxidized, and is measured by a heat unit called a calorie.

A calorie is the amount of heat required to raise 1 pound of water 4° F., or 1 kilogram of water 1° C.

The body will require varying amounts of heat and energy under different conditions.

Man sleeping requires	65 calories per hour
Man sitting at rest requires	100 calories per hour
Man at light muscular work requires	170 calories per hour

Man at active muscular work requires	290 calories per hour
Man at severe muscular work requires	450 calories per hour
Man at very severe muscular work requires	600 calories per hour

(*Atwater* and *Benedict*)

FOOD REQUIREMENT AS MODIFIED BY AGE AND SEX

A woman requires	.8 amount of food needed by a man
Boy 14 to 17 years	.8 amount of food needed by a man
Children 10 to 13 years	.6 amount of food needed by a man
Children 6 to 9 years	.5 amount of food needed by a man
Children 2 to 5 years	.4 amount of food needed by a man
Less than 2 years	.3 amount of food needed by a man

APPROXIMATE FOOD REQUIREMENT FOR ONE DAY
(H. C. SHERMAN)

Man doing light muscular work	3000 to 3500 calories
Woman doing light muscular work	2700 calories
Boy 14 to 17 years	2500 to 3000 calories
Girl 14 to 17 years	2200 to 2600 calories
Children 10 to 13 years	1800 to 2200 calories
Children 6 to 9 years	1400 to 2000 calories
Children 2 to 5 years	1200 to 1500 calories
Children 1 to 2 years	900 to 1200 calories

Protein Requirement. — The cells of the body are constantly breaking down and in the growing body new cells are forming, hence food must furnish material for growth and repair.

As the cells contain nitrogen, a food which contains nitrogen in a form in which the body can assimilate it must be furnished. Protein foods contain 16 per cent nitrogen and are the only foods which do contain it, so they are absolutely necessary for the body.

The carbon and hydrogen of protein are first split off by the body and oxidized, yielding heat and energy before the nitrogen is available for tissue building. The broken-down protein of the cells leaves the body in the form of urea and other compounds excreted by the kidneys. The amount of protein thus lost to the body each day must be replaced by protein foods in order that the body may maintain a protein equilibrium. The amount required is variously estimated by different authorities. However, as a general estimate, about 10 to 12 per cent of the total energy requirement should be furnished by protein foods. Thus in a dietary requiring 3000 calories per day, from 300 to 360 calories should be furnished by protein foods. As each gram of protein furnishes 4 calories, the total amount required would be from 75 to 90 grams.

The average American dietary is very high in protein content, furnishing about 125 grams (about 4 ounces) of protein per day. Protein foods not required for cell growth and repair are not stored in the body, but are eliminated by the kidneys; hence an increased protein diet means increased protein elimination.

NOTE. — Students compute food value of amount of common foodstuffs obtained for ten cents. Compute dietaries of amount of food required by persons of various ages and occupations, by the Percentage Composition Method, estimating cost.

PERCENTAGE COMPOSITION METHOD

Dietary for Man doing Light Muscular Work

Calorie Requirement, 3000 to 3500 calories.
Protein Requirement, 300 to 420 calories.

Food	Amount	Protein Per Cent of Lb.	Fats Per Cent of Lb.	Carbohydrates Per Cent of Lb.	Calories Furnished
Breakfast					
Banana	$\frac{1}{4}$ lb.	0.2	0.1	3.5	65.0
Oatmeal	1 oz.	1.0	0.4	4.1	112.5
Milk	$\frac{1}{3}$ lb.	1.1	1.3	1.6	103.3+
Eggs	$\frac{1}{4}$ lb.	3.2	2.3	—	158.7+
Ham	1 oz.	0.8	2.0	—	102.1+
Bread	$\frac{1}{12}$ lb.	0.7	0.1	4.4	100.0
Butter	$\frac{1}{2}$ oz.	—	2.6	—	106.5
Coffee	1 cup	—	—	—	—
Sugar	1 oz.	—	—	6.2	109.3
Dinner					
Beef, round	2 oz.	2.3	1.6	—	111.2+
Cabbage	4 oz.	0.3	—	1.2	28.7+
Corn	2 oz.	0.3	0.1	2.4	55.0
Potatoes	8 oz.	0.9	0.05	7.3	147.5
Bread	$\frac{1}{6}$ lb.	1.5	0.2	8.8	200.0
Butter	$\frac{1}{2}$ oz.	—	2.6	—	106.5
Sugar	1 oz.	—	—	6.2	109.3
Dessert, as cake	2 oz.	0.7	1.1	7.9	203.7
Walnuts	$\frac{1}{12}$ lb.	0.5	2.2	0.5	104.1
Supper					
Cream Celery Soup	8 oz.	1.0	1.4	2.5	117.5
Cream Crackers	1 oz.	0.6	0.7	4.3	120.3
Bread	$\frac{1}{6}$ lb.	1.5	0.2	8.8	200.0
Butter	$\frac{1}{2}$ oz.	—	2.6	—	106.5
Cheese	1 oz.	1.5	2.1	0.1	117.8-
Buttermilk	8 oz.	1.5	0.2	2.4	80.0
Apples	12 oz.	0.2	0.2	8.1	142.5
Cake	2 oz.	0.7	1.1	7.9	203.7
Total		20.5	25.15	88.2	3002.7

AVERAGE COMPOSITION OF FOODS

PERCENTAGE COMPOSITION

Bulletin 142, U. S. Dept. Agriculture.

FOOD MATERIALS AS PURCHASED	REFUSE	WATER	PROTEIN	FAT	CARBO-HYDRATES	ASH	NO. OF CALORIES PER LB.
Animal Food	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	
Beef							
Porterhouse steak	12.7	52.4	19.1	17.9	—	0.8	1100
Loin	13.3	52.5	16.1	17.5	—	0.9	1025
Ribs	20.8	43.8	13.9	21.2	—	0.7	1135
Flank	10.2	54.0	17.0	19.0	—	0.7	1105
Round	7.2	60.7	19.0	12.8	—	1.0	890
Veal							
Breast	21.3	52.0	15.4	11.0	—	0.8	745
Leg	14.2	60.1	15.5	7.9	—	0.9	625
Mutton							
Leg, hind . . .	18.4	51.2	15.1	14.7	—	0.8	890
Loin chops . .	16.0	42.0	13.5	28.3	—	0.7	1415
Flank	9.9	39.0	13.8	36.9	—	0.6	1770
Lamb							
Breast	19.1	45.5	15.4	19.1	—	0.8	1075
Leg, hind . . .	17.4	52.9	15.9	13.6	—	0.9	860
Pork, fresh							
Ham, hind leg .	10.7	48.0	13.5	25.9	—	0.8	1320
Loin chops . .	19.7	41.8	13.4	24.2	—	0.8	1245
Ham, smoked .	13.6	34.8	14.2	33.4	—	4.2	1635
Salt pork . . .	—	7.9	1.9	86.2	—	3.9	3555
Bacon	7.7	17.4	9.1	62.2	—	4.1	2715
Chicken, fowls .	25.9	47.1	13.7	12.3	—	0.7	765
Turkey . . .	22.7	42.4	16.1	18.4	—	0.8	1060
Fish							
Cod, fresh, dressed	29.9	58.5	11.1	0.2	—	0.8	220
Perch, dressed .	35.1	50.7	12.8	0.7	—	0.9	275
Cod, salt . . .	24.9	40.2	16.0	0.4	—	18.5	325
Salmon, canned .	—	63.5	21.8	12.1	—	2.6	915
Sardines . . .	5.0	53.6	23.7	12.1	—	5.3	950
Oysters, solids .	—	88.3	6.0				
Eggs	11.2	65.5	13.1	9.3	—	0.9	635
Butter	—	11.0	1.0	85.0	—	3.0	3410
Milk, whole . .	—	87.0	3.3	4.0	5.0	0.7	310
Milk, skim . .	—	90.5	3.4	0.3	5.1	0.7	165
Buttermilk . .	—	91.0	3.0	0.5	4.8	0.7	160
Cream	—	74.0	2.5	18.5	4.5	0.5	865
Cheese	—	34.2	25.9	33.7	2.4	3.8	1885

AVERAGE COMPOSITION OF FOODS — *Continued*

Food Materials as Purchased	Refuse	Water	Protein	Fat	Carbo-hydrates	Ash	No. of Calories per Lb.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	
Vegetable Foods							
Entire wheat flour	—	11.4	13.8	1.9	71.9	1.0	1650
Graham flour	—	11.3	13.3	2.2	71.4	1.8	1645
Wheat flour, high grade and medium	—	12.0	11.4	1.0	75.1	0.5	1635
Macaroni	—	10.3	13.4	0.9	74.1	1.3	1645
Corn meal	—	12.5	9.2	1.9	75.4	1.0	1635
Oat breakfast food	—	7.7	16.7	7.3	66.2	2.1	1800
Rice	—	12.3	8.0	0.3	79.0	0.4	1620
White bread	—	35.3	9.2	1.3	53.1	1.1	1200
Graham bread	—	35.7	8.9	1.8	52.1	1.5	1195
Cake	—	19.9	6.3	9.0	63.3	1.5	1630
Cream crackers	—	6.8	9.7	12.1	69.7	1.7	1925
Sugars, etc.							
Molasses	—	—	—	—	70.0	—	1225
Candy					96.0		1680
Honey					81.0		1420
Sugar, granulated					100.0		1750
Maple syrup					71.4		1250
Vegetables							
Beans, dried	—	12.6	22.5	1.8	59.6	3.5	1520
Beans, string, fresh	7.0	83.0	2.1	0.3	6.9	0.7	170
Beets	20.0	70.0	1.3	0.1	7.7	0.9	160
Cabbage	15.0	77.7	1.4	0.2	4.8	0.9	115
Celery	20.0	75.6	0.9	0.1	2.6	0.8	65
Corn, green, edible portion	—	75.4	3.1	1.1	19.7	0.7	440
Cucumbers	15.0	81.0	0.7	0.2	2.6	0.4	65
Lettuce	15.0	80.5	1.0	0.2	2.5	0.8	65
Onions	10.0	78.9	1.4	0.3	8.9	0.5	190
Mushrooms	—	88.1	3.5	0.4	6.8	1.2	185
Peas, dried	—	9.5	24.6	1.0	62.0	2.9	1565
Peas, fresh, shelled	—	74.6	7.0	0.5	16.9	1.0	440
Potatoes	20.0	62.6	1.8	0.1	14.7	0.8	295
Spinach	—	92.3	2.1	0.3	3.2	2.1	95
Tomatoes	—	94.3	0.9	0.4	3.9	0.5	100
Turnips	30.0	62.7	0.9	0.1	5.7	0.6	120

AVERAGE COMPOSITION OF FOODS — *Continued*

Food Materials as Purchased	Refuse	Water	Protein	Fat	Carbo-hydrates	Ash	No. of Calories per Lb.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	
Canned Vegetables							
Baked beans	—	68.9	6.9	2.5	19.6	2.1	555
Peas, green	—	85.3	3.6	0.2	9.8	1.1	235
Corn, green	—	76.1	2.8	1.2	19.0	0.9	430
Fruits, etc., fresh							
Apples	25.0	63.3	0.3	0.3	10.8	0.3	190
Bananas	35.0	48.9	0.8	0.4	14.3	0.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	0.4	295
Oranges	27.0	63.4	0.6	0.1	8.5	0.4	150
Strawberries	5.0	85.9	0.9	0.6	7.0	0.6	150
Watermelon	59.4	37.5	0.2	0.1	2.7	0.1	50
Fruits, dried							
Apples		28.1					
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1275
Figs	—	18.8	4.3	0.3	74.2	2.4	1280
Nuts							
Almonds	45.0	2.7	11.5	30.2	9 5	1.1	1515
Cocoanuts	48.8	7.2	2.9	25.9	14.3	0.9	1295
Hickory nuts	62.2	1.4	5.8	25.	4.3	0.8	1145
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1775
Miscellaneous							
Chocolate	—	5.9	12.9	48.7	30.3	2.2	5625
Cocoa, powdered	—	4.6	21.6	28.9	37.7	7.2	2160

THE "100 CALORIE PORTION" METHOD

To make the methods of determining food value more graphic and more easily ascertained in everyday life, tables have been prepared stating the weight of various foods required to furnish "100 calories," also stating their approximate bulk; these are called "standard" or "100 calorie" portions.

EXAMPLES: — Small glass of whole milk furnishes 100 calories.

1 large egg furnishes 100 calories.

1 ordinary pat of butter furnishes 100 calories.

This method makes it possible to determine roughly the amount of heat and other forms of energy furnished in the daily diet.

NOTE. — Student weigh out 100 calorie portions of various foods to train the eye to estimate quickly the approximate values of foods. (See table of 100 calorie portions.)

TO FIND "100 CALORIE PORTIONS" FROM PERCENTAGE COMPOSITION TABLE (H. C. SHERMAN)

The number of ounces in a pound (16 oz.) is to the number of calories in any given food as x is to 100 (calorie portion).

EXAMPLE: — (Milk 325 calories to 1 pound)

$$16 \text{ (oz.)} : 325 :: x : 100 = 4.9$$

Hence 4.9 oz. of milk will yield upon oxidation 100 calories.

NOTE. — Students compute 100 calorie portions of various foods from "Percentage Composition of Food," comparing results with table of "100 Calorie Portions." Compute dietaries of amount of food required by persons of various ages and occupations, by 100 Calorie Portion Method, estimating cost. Cook and serve a dinner or luncheon, serving the food in 100 calorie portions.

100-CALORIE PORTION METHOD

Dietary for Man doing Light Muscular Work

Total calorie requirement . . . . . 3000 to 3500 calories.
Protein requirement, 12% total calories 360 to 420 calories.

Food	Amount	Protein Calories	Fats Calories	Carbohydrates Calories	Total Calories
Breakfast					
Prunes . .	3	3	0	97	100
Oat meal .	1½ large serving	18	0	75	100
Milk . . .	Small glass	19	52	29	100
Eggs . . .	2 large	64	136	—	200
Ham, cooked	Small serving	14	86	—	100
Bread . .	1 slice	13	6	81	100
Butter . .	1 pat	0.5	99.5	0	100
Coffee . .		0	0	0	0
Sugar . .	3 teaspoons	0	0	100	100
Dinner					
Beef, round	1 serving	90	10	—	100
Cabbage .	3½ oz.	10	4	36	50
Corn . . .	1 side dish	13	10	77	100
Potatoes, mashed .	1 serving	10	25	65	100
Bread . .	2 slices	26	12	162	200
Butter . .	1 pat	0.5	99.5	0	100
Pickles . .	1.4 oz.	1.8	1.5	6.7	10
Tea . . .		0	0	0	0
Sugar . .	3 teaspoons	0	0	100	100
Apple pie .	1 piece	15	96	189	300
Walnuts .	6	10	83	7	100
Supper					
Bean soup .	1 large plate	20	20	60	100
Crackers .	3 Uneeda	9.4	20	70.6	100
Cheese . .	1½-in. cube	25	73	2	100
Bread . .	2 slices	26	12	162	200
Butter . .	1 pat	0.5	99.5	0	100
Buttermilk	1½ glass	34	12	54	100
Baked apples	3.3 oz.	2	5	93	100
Gingerbread	1 square	12	46	142	200
Total . .		436.7	1015	1608.3	3060

TABLE OF 100-CALORIE PORTIONS

Food Values

"Food and Dietetics," *Norton*, Published by American School of Home Economics, Chicago

Food	Portion Containing 100 Calories (app.)	Grams	Ounces	Protein	Fat	Carbohydrates
Cooked Meats						
Beef, round, boiled, fat	Small serving	36	1.3	40	60	0
Beef, round, boiled, lean	Large serving	62	2.2	90	10	0
Lamb chops, boiled	1 small chop	27	0.96	24	76	0
Lamb, leg, roasted	Ordinary serving	50	1.8	40	60	0
Ham, boiled, fat	Small serving	20.5	0.73	14	86	0
Veal, leg, boiled	Small serving	67.5	2.4	73	27	0
Uncooked Meats, Edible Portion						
Beef loin, lean	Ordinary serving	50	1.8	40	60	0
Porterhouse steak	Small serving	36	1.3	32	68	0
Sirloin steak	Small serving	40	1.4	31	69	0
Beef ribs	Ordinary serving	52	1.8	42	58	0
Beef, round	Ordinary serving	63	2.2	54	46	0
Chicken, broilers	Large serving	90	3.2	79	21	0
Liver, veal	2 small servings	79	2.8	61	39	0
Mutton, leg	Ordinary serving	50	1.8	41	59	0
Pork chops, loin	Very small serving	27	0.97	18	82	0
Turkey	2 small servings	33	1.2	29	71	0
Vegetables						
Asparagus, cooked		206	7.19	18	63	19
Baked beans, canned	Small side dish	75	2.66	21	18	61
Beans, string, cooked	5 servings	480	16.66	15	48	37
Beets, cooked	3 servings	245	8.7	2	23	75
Cabbage		310	11.0	20	8	72
Carrots, fresh		215	7.6	10	8	82
Cauliflower (as purchased)		312	11.0	23	15	62
Celery (edible portion)		540	19.0	24	5	71
Corn, cooked	One side dish	99	3.5	13	10	77
Cucumbers (edible portion)		565	20.0	18	10	72
Lettuce (edible portion)		505	18.0	25	14	61
Mushrooms (as purchased)		215	7.6	31	8	61
Onions, cooked	2 large servings	240	8.4	12	40	48
Parsnips, cooked		163	5.84	10	34	56
Peas, green, cooked	One serving	85	3.0	23	27	50
Potatoes, baked	One good-sized	86	3.05	11	1	88

TABLE OF 100-CALORIE PORTIONS — *Continued*

Food	Portion Containing 100 Calories (app.)	Grams	Ounces	Protein	Fat	Carbohydrates
Potatoes, mashed	One serving	89	3.14	10	25	65
Radishes (as purchased)		480	17.0	18	23	79
Rhubarb (edible part)		430	15.0	10	27	63
Spinach, cooked	2 ordinary servings	174	6.1	15	66	19
Tomatoes, canned		431	15.2	21	7	72
Turnips (edible part)	2 large servings	246	8.7	13	4	83
Fruits, dried						
Apples		34	1.2	3	7	90
Dates (edible part)	3 large servings	28	0.99	2	7	91
Figs (edible part)	1 large serving	31	1.1	5	0	95
Prunes (as purchased)	3	38	1.35	3	0	97
Raisins	25	28	1.0	3	9	88
Fruits, fresh or cooked						
Apples (as purchased)	2	206	7.3	3	7	90
Apples, baked		94	3,3	2	5	93
Bananas (edible part)	1 large	100	3.5	5	5	90
Cantaloupe		243	8.6	6	0	94
Grapes (as purchased)		136	4.8	5	15	80
Oranges (as purchased)	1 large	270	9.4	6	3	91
Peaches (as purchased)	3 ordinary	290	10.0	7	2	91
Strawberries	2 servings	260	9.1	10	15	75
Watermelon		760	27.0	6	6	88
Dairy Products						
Butter	Ordinary pat	12.5	0.44	0.5	99.5	0
Buttermilk	1½ glass	275	9.7	34	12	54
Cheese, American	1½ cubic inch	22	0.77	25	73	2
Cream	¼ ordinary glass	49	1.7	5	86	9
Milk, skimmed	1½ glass	255	9.4	37	7	56
Milk, whole	Small glass	140	4.9	19	52	29
Cakes, Pastries, etc.						
Cake, chocolate layer	½ ordinary piece	28	0.98	7	22	71
Cake, gingerbread	½ ordinary piece	27	0.96	6	23	71
Custard	Ordinary cup	122	4.29	26	56	18
Doughnuts	½ doughnut	23	0.8	6	45	49
Pie, apple	⅓ piece	38	1.3	5	32	63
Pudding, cream rice	Small serving	75	2.65	8	13	79
Tapioca, cooked	Ordinary serving	108	3.85	1	1	98
Sweets and Pickles						
Honey	4 teaspoons	30	1.05	10	3	87
Molasses		35	1.2	0.5	0	99.5
Olives, green (edible portion)	7	32	1.1	1	84	15

TABLE OF 100-CALORIE PORTIONS — *Continued*

Food	Portion Containing 100 Calories (app.)	Grams	Ounces	Protein	Fat	Carbohydrates
Pickles, mixed		415	14.6	18	15	67
Sugar, granulated	3 teaspoons or 1½ lumps	24	0.86	0	0	100
Syrup, maple	4 teaspoons	35	1.2	0	0	100
Nuts, Edible Portion						
Almonds	8 to 15	15	0.53	13	77	10
Cocoanut		16	0.57	4	77	19
Hickory nuts		13	0.47	9	85	6
Peanuts	13 double	18	0.62	20	63	17
Walnuts, California	About 6	14	0.48	10	83	7
Cereals and Breadstuffs						
Soda crackers	3½ Uneeda biscuit		0.83	9.4	20	70.6
Bread, brown	Ordinary thick slice	43	1.5	9	7	84
Bread, white, home made	Ordinary thick slice	38	1.3	13	6	81
Corn flakes	Ordinary cereal dish full	27	0.97	11	1	88
Corn meal		27	0.96	10	5	85
Crackers, Graham	2	23	0.82	9	20	71
Hominy, cooked	Large serving	120	4.2	11	2	87
Macaroni, cooked	Ordinary serving	110	3.85	14	15	71
Oatmeal, cooked	1½ serving	159	5.6	18	7	75
Rice, cooked	Ordinary cereal dish	87	3.1	10	1	89
Shredded wheat	1 biscuit	27	0.94	13	4.5	82.5
Miscellaneous						
Eggs	1 large	59	2.1	32	68	0
Soup, beef		380	13.0	69	14	17
Soup, bean	Very large plate	150	5.4	20	20	60
Soup, cream celery	2 plates	180	6.3	16	47	37
Consommé		830	29.0	85	0	15
Chocolate, bitter	½ square	16	0.56	8	72	20
Ice cream		45	1.6	5	62	38
Boiled salad dressing			1.4	10.2	88.6	1.2
Chocolate, beverage	⅔ of ordinary cup	84	3	8.8	45.7	44.5

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